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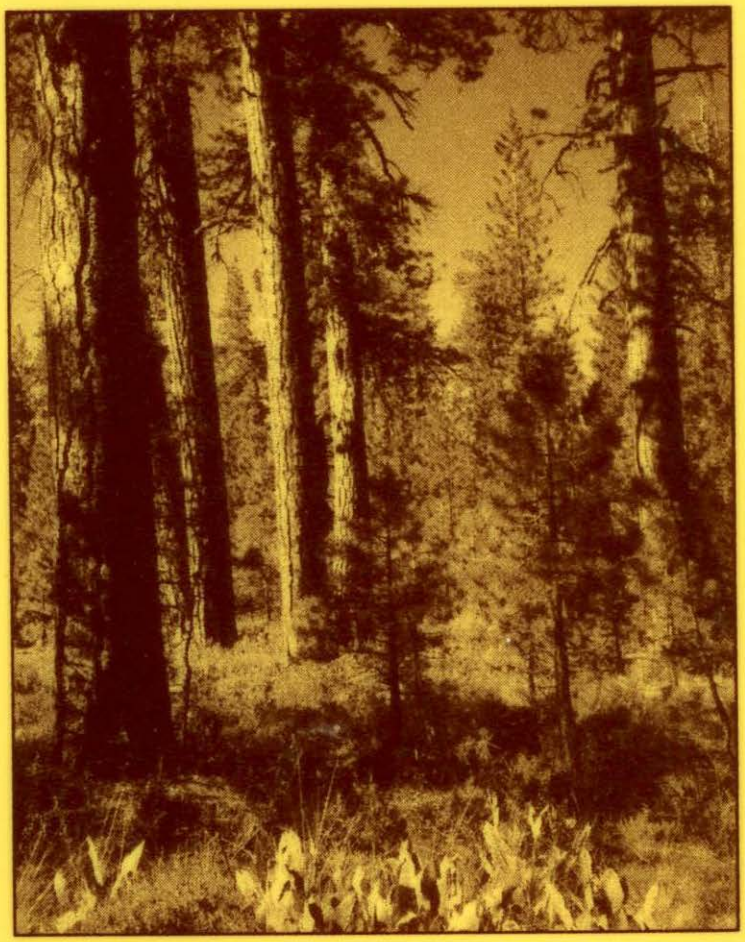
Ecological Guide to Eastside Pine Plant Associations

Northeastern California: Modoc, Lassen, Klamath, Shasta-Trinity, Plumas and Tahoe National Forests



Ecological Guide to Eastside Pine Plant Associations

Northeastern California: Modoc, Lassen, Klamath, Shasta-Trinity, Plumas, and Tahoe National Forests

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INTRODUCTION

This field edition is a condensed version of the larger, more detailed desk guide. It is intended as a tool for field use and prompt reference to key management and ecological information. For more detail refer to the complete desk guide.

The descriptions and keys were developed for Eastside Pine stands over 100 years old. Eastside Pine stands on the Modoc, Lassen, Shasta-Trinity, Klamath, Plumas, and Tahoe National Forests were sampled to develop this guide. The association descriptions apply to Eastside Pine stands on National Forest lands in northeastern California.

This classification is "final" in that further major changes in groups are not anticipated, however, additions to groups, particularly undersampled groups, will be forthcoming as more information becomes available.

CLASSIFICATION OVERVIEW

This classification is based on an organization of the patterns of vegetation perceived in mature and old growth pine-dominated stands with a minimum of understory disturbance. Vegetation patterns in these stands are relatively more stable and are therefore easier to categorize than younger, more dynamic stands in disturbed environments. Patterns of vegetation in older, relatively undisturbed stands provide a useful context that facilitates better understanding of younger stand dynamics.

Concepts of succession are rapidly changing as ecologists and others develop better understanding of the role of disturbance, both human and non-human caused, and the interactions of living organisms and environments. The concept of a single climax community or "Potential Natural Community" , defined as "the biotic community that would be established if all successional sequences of its ecosystem without additional human-caused disturbance under present environmental conditions..."(FSM 2060) is expanding to include multiple steady states or potentials that can exist given different transitions, disturbances, and/or ecological processes. These expanded concepts of succession and vegetation dynamics are particularly useful in arid environments and environments that have developed with frequent disturbance, such as the Eastside Pine communities, where different site potentials can be displayed depending on disturbance regimes.

This classification is hierarchical in that the basic organizing unit is the Series, or the aggregation of taxonomically related plant associations that takes the name of the "climax" species that dominates the principle vegetation layers. The Plant Association or Plant Community Type is a subset of taxonomically related communities within a Series.

Indicator plants and plants with high fidelity are used to distinguish between the plant associations and communities. Plants are chosen as indicators for their fidelity with individual or combined environmental factors or for their predictive capacity for vegetation response to disturbance or management. Many plants that are frequently encountered in the Eastside Pine region indicate the seral conditions that accompany disturbance, rather than convey useful environmental information about the site. These "disturbance indicators" are not used to distinguish between associations.

VEGETATION OVERVIEW

There are several broad topographic and vegetation gradients in the Eastside Pine region of Northeastern California.

From west to east, from about the Hat Creek Rim area to the Warner Mountains, elevations gradually rise and the climate generally becomes drier as the rain shadow of the Cascade Range

becomes more evident. In the western part of the region, species such as black oak and Oregon white oak are apparent which drop out farther to the east. Red fir stands can be found in the western and southern high elevation areas of the region; however red fir drops out entirely in the Modoc Plateau and Warner Mountains. Washoe pine is found at the extreme east boundary of the region, at elevations exceeding 5800 feet.

An obvious change on a north to south gradient is a transition from ponderosa pine in the northern part of the region to Jeffrey pine in the southern part of the region. The northernmost Jeffrey pine trees encountered in the study area were found slightly north of Canby, CA. The environmental changes that accompany this transition are generally an increase in elevation from north to south, towards the Sierra Nevada mountains, and a general transition to less developed soils.

Lower elevation sites tend to be drier because of topography, and tend to be dominated by open pine stands and shade-intolerant shrubs such as bitterbrush and sagebrush. These were the sites that historically experienced frequent underburns. Higher elevation stands often exhibit white fir regeneration and higher stand densities. These environments favor more shade-tolerant shrubs such as serviceberry, snowberry, and chokecherry.

Dry environments are usually dominated by ponderosa or Jeffrey pine, accompanied by drier site understory plants such as bitterbrush, mountain mahogany, and sagebrush, whereas moist sites that are near riparian areas or have favorable micropositions may have white fir regeneration and moist site indicators such as interior rose or *Smilacina* spp.

Stands with relatively recent fire may have open herbaceous understories, or may have shrub-dominated understories characterized by fire sprouting shrubs such as snowbrush and greenleaf manzanita. Stands that have been excluded from fire for a number of years usually have understory development of suppressed pines, western juniper, and/or white fir or lodgepole pine.

Ponderosa pine series stands are found at elevations ranging from 3380 to 6000 feet in the study area. The average elevation of the plots dominated by ponderosa pine is 4800 feet. These are relatively low elevations within the study area. Soils are usually mesic temperature regime, and are often deeper with higher potential productivity than soils in Jeffrey pine sites.

Jeffrey pine series stands are found at higher elevations (4400 to 7200 feet; average elevation 5800 feet), and on generally more exposed sites with shallower soils. Soil temperature regime is often frigid. Jeffrey pine series sites are often lower in tree productivity measures such as total basal area and stand density index.

Considerable mixing of ponderosa and Jeffrey pine occurs in stable stands. These are abbreviated as "yellowpine" stands in this document. These stands have attributes that are intermediate between pure ponderosa and Jeffrey pine habitats.

Stands with Washoe pine are found mostly in the Warner Mountains, although isolated stands and individuals are located on the Milford and Sierraville Districts, Plumas and Tahoe Forests, respectively. This species may also occur at high elevations in Lassen National Park and similar locales. Elevation range for the study plots with Washoe pine is 5800 to 7800 feet, with an average elevation of 7130 feet.

Stands with white fir succession (Pine-white fir communities) are found throughout the area where there is higher precipitation or soil moisture, higher elevation, and long-term fire exclusion.

USING THIS GUIDE

Plant Associations are named by the dominant tree species or series name, followed by one or two subordinate indicator species names usually in a lower vegetative layer. A slash, "/" separates life forms (trees/shrubs/herbaceous), a dash "-" separates members of the same life form (e.g.,

"Ponderosa-Jeffrey), and a double slash ,"//" , where used, indicates a distinctive abiotic component of the type, e.g., "Ponderosa/Bitterbrush/Fescue//GRANITE".

Scientific plant names used in the text follow Munz (1973). Common names follow Weeden (1981), Neihous and Ripper (1978), Abrams (1960), and Hitchcock and Cronquist (1973). Plant codes consist of the first two letters of the genus and the first two letters of the species, followed by a numerical tie-breaker if necessary. An example is PIWA for *Pinus washoensis*. Standard codes for California species are used (Powell 1987). The code "YP" refers to "Yellowpine", an alternate, shorter term for Ponderosa-Jeffrey pine stands.

The summary tables in the text include constancy (CON), and characteristic cover. Constancy is the percentage of the plots in which the plant occurred. Characteristic cover is the mean cover in the plots where the plant actually occurred. Cover values are ocular estimates within each layer, independent of other canopy layers.

The number of plots used to distinguish the type is noted on the first page of each type description. Types with fewer than five plots should be considered provisional.

Management interpretations in association and community descriptions are based on field experience, literature, data interpretation, and a review process whereby teams visited characteristic sites and provided management interpretations.

KEYS TO PLANT ASSOCIATIONS AND COMMUNITIES

Complete the field form in Appendix F before using the keys.

THE KEY IS NOT THE CLASSIFICATION! A suitable site will key to a type about 80% of the time. A suitable site is relatively undisturbed, with stand age at least 100 years. Read the type descriptions and summary information in the appendices to select the association or plant community type that best fits. Some sites will fall in between two types and extrapolation will be necessary.

The keys and descriptions were developed for relatively undisturbed stands with trees at least 100 years old. These conditions are becoming increasingly rare in the Eastside Pine region, where much of the landscape has been cut over and young, second growth stands are frequent. Heavily stocked stands of young trees present difficulties because the understory vegetation is usually depauperate and often consists of species that merely indicate site disturbance, not the ecological type. This guide attempts to provide the user with information to help discriminate between species that have ecological indicator value, and species that indicate site disturbance only.

Always use the following steps for any keys in this guide:

1. Walk around and get a general feel for the site characteristics and the overstory and understory vegetation. Ask yourself the kinds of conditions represented by the guild of species your are seeing. Look especially at tree regeneration layers, indicator shrub cover (see field form list), and perennial forbs and grasses. Try to select as undisturbed a site as possible; potential sites include small areas near unlogged trees. Severe logging disturbance can completely mask plant indicators for many years in the Eastside Pine region. Keep in mind that many species in the Eastside Pine region are more indicative of ground disturbance or fire history than site biological potential.

2. Select a vegetatively uniform area representative of the community in question. To record data on the field form (Appendix F), use a 1/10 acre plot (radius about 37.5 feet).

3. Identify and record tree, shrub, and herbaceous species and estimate the cover of each. In a 1/10 acre plot, a 7 foot by 6 foot rectangle is approximately one percent. Trace amounts of vegetation count as one percent.

4. Work through the key step by step and without omitting couplets. The key is a tool to help classify most sites but type descriptions should be review to verify identifications. On severely disturbed sites, check less disturbed areas nearby; then interpret using slopes, aspects, elevations, latitudes, and soils. Use the Alternate Key as an additional aid in non-modal stands to narrow the choices between types.

5. If the key you are using does not seem to fit, then:

    a. Try working the site through another series.

    b. Use the Alternate Key to narrow the possible choices, and read the descriptions of the types to select an appropriate choice.

    c. Note that closed canopy stands in mid- to late stages of stand development may have depauperate understory tree, shrub, and herbaceous layers. If this seems to be true, reduce all cover values in the key by one class; e.g., "well represented" to "common", and re-try the key. Alternatively, find an adjacent stand with similar site variables but with better vegetative development in the understory layers and retry the key.

TERMINOLOGY IN TEXT AND KEYS IS AS FOLLOWS:

REPRODUCING SUCCESSFULLY: A species appears capable of reproducing itself under current conditions. To evaluate "successful reproduction", consider: 1) Trees per acre. An arbitrary starting point is 10 or more seedlings/saplings/poles per acre; 2) The health and vigor of the reproducing trees; 3) Tree distribution; i.e., tree species are not restricted to atypical microsites and belong to more than one size class in the understory.

ABSENT: Not found in the plot or nearby; 0 percent cover.

PRESENT: Found in the plot; not obviously restricted to atypical microsites.

SCARCE or RARE: Includes "absent", and/or less than 1 percent cover.

POORLY REPRESENTED: One class above "Scarce or Rare." Includes "absent". Usually less than 3 percent cover. Plants are not particularly apparent in the stand.

COMMON: Readily apparent in the stand; 1.1 percent cover and above.

WELL REPRESENTED: Plants are readily apparent; usually more than 5% cover.

ABUNDANT: Immediately apparent to the observer; more than 25 percent cover.

KEY TO SERIES

1 Trees absent or present with canopy less than 20%. Type is shrubland, grassland, riparian, or woodland savanna.
..... Plant communities not described in this guide.

1' Trees present with canopy cover greater than 20%. 2

2 Ponderosa, Jeffrey, Washoe pine trees scarce or absent in the overstory, or not reproducing successfully or not present in all layers of the stand.
..... Series not described in this guide.

2' Ponderosa pine and/or Jeffrey pine or Washoe pine reproducing successfully; these species also dominant in upper tree layers in the stand.
..... 3

3 White fir reproducing successfully; regeneration at least codominant with 3-needle pine regeneration (which may be ponderosa pine, Jeffrey pine, or Washoe pine), and also present to common in midstory and overstory layers.
..... **PINE-WHITE FIR COMMUNITIES**

3' White fir scarce or absent. Ponderosa, Washoe, and/or Jeffrey pine are dominant in the stand and reproducing successfully.
..... 4

4 Washoe pine dominant conifer, and reproducing successfully
..... **WASHOE PINE SERIES**

4' Not as above 5

5 Jeffery pine absent or rare

..... **PONDEROSA PINE SERIES**

5' Jeffrey pine present as dominant, reproducing conifer, or in a mix with ponderosa pine, both species reproducing successfully.
..... 6

6 Ponderosa pine absent or rare
..... **JEFFREY PINE SERIES**

6' Ponderosa pine present with Jeffrey pine in a stable mix.
..... **PONDEROSA-JEFFREY SERIES**

KEY TO TYPES IN THE PONDEROSA PINE SERIES

1 Bitterbrush common or well represented in the shrub layer; serviceberry absent or rare throughout the stand. 2

2 Soil overlain by a pumice overburden
..... **Ponderosa/Bitterbrush/Needlegrass//PUMICE** p.50

2' Soil derived from basaltic or andesitic bedrock geology. 3

3 Idaho fescue common or well represented 4

4 Mountain mahogany common; soils are rocky
..... **Ponderosa/Mahogany-Bitterbrush/Fescue** p.36

4' Mountain mahogany absent or scarce
..... **Ponderosa/Bitterbrush/Fescue** p.48

3' Idaho fescue absent or scarce 5

5 Black oak present
..... **Ponderosa-Black Oak/Bitterbrush/Needlegrass** p.28

5' Black oak absent or rare 6

6 Mountain big sagebrush and western needlegrass present to common
..... **Yellowpine/Sagebrush-Bitterbrush** p.74

6' Not as above 7

7 Greenleaf manzanita present to common; elevation >5100'; western needlegrass present to common
..... **Ponderosa-White fir/Bitterbrush-Manzanita/Needlegrass** p.108

7' Not as above 8

8 Snowbrush and greenleaf manzanita well represented or abundant
..... **Ponderosa/Bitterbrush-Snowbrush-Manzanita/Brome**[2] p.38

8' Snowbrush rare or absent. Greenleaf manzanita rare to common 9

9 Wax current and bloomer goldenbush common
..... **Ponderosa/Bitterbrush-Current/Brome** p.44

9' Not as above 10

10 Arrowleaf balsamroot present to common; Orcutt brome rare or absent 11

11 Incensecedar present to common in regen and upper layers. Serviceberry may be present. ..... **Ponderosa-Incensecedar/Bitterbrush/Balsamroot** p.26

11' Incensecedar; serviceberry absent or rare. Canby bluegrass present to common
..... **Ponderosa/Bitterbrush/Balsamroot** p.46

10' Orcutt brome present to common, in or near a lava flow environment 13

13 Bluebunch wheatgrass present to common
..... **Ponderosa/Bitterbrush-Prunus/Wheatgrass** p.42

13' Bluebunch wheatgrass absent or rare
..... **Ponderosa/Bitterbrush-Prunus/Brome** p.40

1' Bitterbrush absent or rare in 1/10 acre plot 14

14 Mountain big sagebrush common to well represented in shrub layer
..... **Ponderosa/Mtn. Big Sagebrush/Fescue** p.34

14' Not as above 15

15 Snowbrush, greenleaf manzanita abundant. Orcutt brome common
..... **Ponderosa/Bitterbrush-Snowbrush-Manzanita/Brome**[2] p.38

15' Not as above 16

16 Serviceberry with dwarf oregongrape and/or heart-leaved arnica present to common
..... **Ponderosa/Serviceberry-Oregongrape/Arnica** p.30

16' Not as above 18

18 Serviceberry present to common, with or without bitterbrush 19

19 Incensecedar present and reproducing successfully
..... **Ponderosa-Cedar/Bitterbrush/Balsamroot** p.26

19' Incensecedar absent or rare. Chokecherry, wood rose, *Prunus* spp. often present in addition to serviceberry
..... **Ponderosa/Serviceberry-Prunus** p.32

18' Not as above. Re-try the key, or try the Alternate Key to Groups.

KEY TO TYPES IN THE JEFFREY PINE AND PONDEROSA-JEFFREY (YELLOWPINE) SERIES

Note: relative proportions of ponderosa and Jeffrey pine in a stand can vary. Work the other leg of the key if results are initially unsatisfactory.

1 Ponderosa pine absent or scarce, or with much less abundance than Jeffrey pine 2

2 Soils are granitic; bitterbrush and idaho fescue present to common ..... **Yellowpine/Bitterbrush/Fescue//GRANITE** p.82

2' Not as above 3

3 Curlleaf mtn. mahogany clearly the understory dominant with >10% cover. Rock content >20% in lava flows, ridgetops, lava rock outcrops ..... **Jeffrey/Mahogany** p.60

3' Not as above 4

4 Black oak and skunkbrush present ..... **Jeffrey-Black Oak/Skunkbrush** p.56

4' Not as above 5

5 Mtn. big sagebrush common tall shrub, often with greenleaf manzanita. Idaho fescue common or well represented ..... **Jeffrey/Sagebrush/Fescue** p.58

5' Not as above 6

6 Snowberry common in shrub understory, with or without bitterbrush ..... **Jeffrey/Bitterbrush-Snowberry/Bluegrass** p.64

6' Snowberry absent or scarce 7

7 Spreading snowberry present to common in shrub layer. Some white fir regeneration may be present ..... **Yellowpine-White fir/Spreading snowberry/Mulears** p.116

7' Not as above 8

8 Mulears scarce or poorly represented. Mahogany present to common ..... **Jeffrey/Bitterbrush-Mahogany/Needlegrass** p.62

8' Mulears common; Mtn. mahogany, mtn. big sagebrush scarce or absent ..... **Jeffrey/Bitterbrush/Mulears** p.66

1' Ponderosa pine and Jeffrey pine dominate the stand in a stable, successfully reproducing mix (Ponderosa-Jeffrey stands: abbreviated for this key as "Yellowpine")

9 Soils are derived from decomposed granite 10

10 Black oak present 11

11 White fir or Douglasfir regeneration present in the stand; upper Diamond

Mountain Escarpment
..... **Yellowpine-White fir/Bluegrass//GRANITE** p.92

11' White fir; douglasfir absent
..... **Yellowpine-Black Oak/Bitterbrush/Bluegrass//GRANITE** p.70

10' Not as above 12

12 Ponderosa pine with higher canopy cover than Jeffrey pine. Douglas fir, white fir, and incensecedar present.
..... **Yellowpine/Bitterbrush/Butterweed//GRANITE** p.84

12' Shade tolerant tree regeneration absent or rare. Idaho fescue common
..... **Yellowpine/Bitterbrush/Fescue//GRANITE** p.82

9' Soils not granitic, but derived from rhyolitic, andsitic, or basaltic bedrock geology 13

13 Black oak present in the midstory or regeneration layers 14

14 Mahogany, serviceberry present to common
..... **Yellowpine-Black Oak/Serviceberry** p.72

14' Not as above 15

15 Modoc coffeeberry and sandberg bluegrass present to common; douglasfir absent
..... **Yellowpine/Coffeeberry/Bluegrass** p.86

15' Not as above; douglasfir present in regen layer
..... **Yellowpine-Douglasfir/Bitterbrush/Mulears** p.68

13' Black oak absent 16

16 Mountain mahogany well represented or abundant. Bluebunch wheatgrass common grass species. Site is on or near extremely rocky lava flow
..... **Yellowpine/Mahogany/Wheatgrass** p.76

16' Not as above 17

17 Bitterbrush and Idaho fescue abundant understory species
..... **Yellowpine/Bitterbrush/Fescue** p.80

17' Not as above 18

18 Bitterbrush well represented or abundant, usually codominant with mtn. big sagebrush. Mtn. mahogany absent or rare. Western needlegrass present to common
..... **Yellowpine/Sagebrush-Bitterbrush** p.74

18' Mountain mahogany and arrowleaf balsamroot present to common
..... **Yellowpine/Mahogany/Balsamroot** p.78

KEY TO TYPES IN THE PINE-WHITE FIR SERIES

1 Ponderosa pine common and reproducing successfully. Jeffrey pine, Washoe pine absent or rare 2

2 Interior live oak and many-stemmed sedge present ..... **Yellowpine-White fir/Interior live oak**[2] p.112

2' Not as above 3

3 Black oak regeneration and many-stemmed sedge present ..... **Ponderosa-White fir-Black oak/Serviceberry** p.98

3' Not as above 4

4 Lodgepole pine and wax current present ..... **Ponderosa-White fir-Lodgepole/Serviceberry** p.96

4' Not as above 5

5 Community is situated on or near a rocky basalt lava flow, and/or surface rock cover is greater than 15%. Snowbrush is abundant; chokecherry and/or bitter cherry common ..... **Ponderosa-White fir/Snowbrush/Needlegrass** p.106

5' Not as above 6

6 Bitterbrush or greenleaf manzanita common; serviceberry rare or absent ..... **Ponderosa-White fir/Bitterbrush-Manzanita/Needlgrass** p.108

6' Serviceberry present; sometimes common 7

7 Heartleaf arnica present to common; dwarf oregongrape; wheeler bluegrass usually present to common ..... **Ponderosa-White fir/Serviceberry-Oregongrape** p.100

7' Not as above 8

8 Spreading snowberry common ..... **Ponderosa-White fir/SpreadingSsnowberry** p.104

8' Spreading snowberry sparse or rare. Bitter cherry, chokecherry, Modoc plum may be present ..... **Ponderosa-White fir/Serviceberry-Snowbrush/Brome** p.102

1' Jeffrey pine present, either as sole three-needle pine, or codominant with ponderosa pine .. 9

) Ponderosa pine absent or rare 10

10 Site is on granitic soils ..... **Jeffrey-White fir/Bluegrass//GRANITE** p.92

10' Site is on andesitic or basaltic-origin soils 11

11 Mountain snowberry common ..... **Jeffrey-White fir/Snowberry/Bluegrass** p.94

11' Not as above. Spreading snowberry present to common
..... **Yellowpine-White fir/Spreading snowberry/Mulears** p.116

9' Ponderosa pine present, with jeffrey pine and white fir 12

12 Soils are deep; sandy; ashy; derived from relatively recent pyroclastic flows. Shrub understory is sparse
..... **Yellowpine-White fir/Needlegrass//ASH** p.114

12' Not as above 13

13 Soils are granitic 14

14 Wheeler bluegrass present to common
..... **Jeffrey-White fir/Bluegrass//GRANITE** p.92

14' Idaho fescue or western needlegrass present to common
..... **Yellowpine/Bitterbrush/Butterweed//GRANITE** p.84

13' Not as above 15

15 Interior live oak present as a shrub or small tree
..... **Yellowpine-White fir/Interior Live Oak** p.112

15' Not as above 16

16 Serviceberry, dwarf oregon grape, heartleaf arnica common
..... **Yellowpine-White fir/Serviceberry-Oregongrape** p.118

16' Not as above 17

17 Huckleberry oak present in the shrub understory
..... **Yellowpine-White fir/Huckleberry oak/Mulears** p.110

17' Not as above 18

18 Huckleberry oak absent. Spreading snowberry common
..... **Yellowpine-White fir/Spreading snowberry/Mulears** p.116

18' Not as above. Re-try the key, or try the Alternate Key to Groups.

KEY TO TYPES IN THE WASHOE PINE SERIES

1 Pinemat manzanita common ..... **Washoe/Pinemat manzanita** p.122

1' Pinemat manzanita absent or rare
..... **Washoe-White fir/Snowberry/Starwort** p.124

ALTERNATE KEY TO GROUPS

This key organizes the plant associations and communities by major understory species cover group, regardless of overstory tree cover species. The user should determine the dominant understory grouping that the site in question falls into, and then choose from among the listed assocations and community types by working through the key. This key will work the best in stands that are over 100 years old, and relatively undisturbed, although the user can try this key in younger, more disturbed settings.

1 Shrubs are sparse or absent altogether, on volcanic sands/ash ..... **PINE//ASH GROUP**
1' Not as above 2

2 Stand is situated on granitic soils ..... **PINE//GRANITE GROUP**
2' Not as above 3

3 Black oak or Oregon white oak present in the stand ..... **PINE/BLACK OAK GROUP**
3' Not as above 4

4 Interior laive oak present in the stand ..... **PINE/INTERIOR LIVE OAK GROUP**
4' Not as above 5

5 Pinemant manzanita present in the shrub layer ..... **PINE/PINEMAT MANZANITA GROUP**
5' Not as above 6

6 Mountain mahogany cover present to abundant ..... **PINE/MAHOGANY GROUP**
6' Not as above 7

7 Spreading snowberry present to common in the stand ..... **PINE/SPREADING SNOWBERRY GROUP**
7' Not as above 8

8 Mountain snowberry common ..... **PINE/MOUNTAIN SNOWBERRY GROUP**
8' Not as above 9

9 Serviceberry present to common. Canopy cover and basal area often high, limiting presence and cover of other shrubs. Bitterbrush canopy cover usually <3% ..... **PINE/SERVICEBERRY GROUP**
9 Not as above 10

10 Mountain big sagebrush present to abundant ..... **PINE/SAGEBRUSH GROUP**
10' Not as above 11

11 Greenleaf manzanita and snowbrush common to abundant ..... **PINE/SNOWBRUSH-MANZANITA GROUP**
11' Not as above 12

12 Huckleberry oak present to dominant in the shrub layer ..... **PINE/HUCKLEBERRY OAK GROUP**

12' Not as above 13

13 Bitterbsush present to abundant
..... **PINE/BITTERBRUSH GROUP**

13' Stand is too young, too disturbed, or in a different series or type. Re-try the key, or try the Key to Series.

PINE//ASH GROUP

One association in the type ..... **Yellowpine-White fir//ASH** p.114

PINE//GRANITE GROUP

1 Black oak present and regenerating
2 White fir present and regenerating successfully
..... **Jeffrey-White fir/Bluegrass//GRANITE** p.92

2' White fir absent . **Yellowpine-Black Oak/Bitterbrush/Bluegrass//GRANITE** p.70

1' Not as above 3

3 Idaho fescue present to abundant; white fir absent
..... **Yellowpine/Bitterbrush/Fescue//GRANITE** p.82

3' Not as above 4

4 Wheeler bluegrass present to common. Western needlegrass absent.
..... **Jeffrey-White Fir/Bluegrass//GRANITE** p.92

4' Not as above 5

5 Ponderosa pine present,with higher canopy cover than Jeffrey pine
..... **Yellowpine/Bitterbrush/Butterweed//GRANITE** p.84

5' Not as above. Ponderosa pine rare or absent
..... **Jeffrey/Bitterbrush-Snowberry/Bluegrass** p.64

PINE/BLACK OAK GROUP

1 Jeffrey pine absent 2

2 White fir present and reproducing successfully
..... **Ponderosa-White Fir-Black Oak/Serviceberry** p.98

2' White fir absent
..... **Ponderosa-Black Oak/Bitterbrush/Needlegrass** p.28

1' Jeffrey pine present and reproducing successfully 3

3 Ponderosa pine absent ..... **Jeffrey-Black Oak/Skunkbrush** p.56

3' Not as above 4

4 Spurred lupine present to common
..... **Yellowpine-Black Oak/Serviceberry** p.72

4' Not as above ..... **Yellowpine/Coffeeberry/Bluegrass** p.86

PINE-INTERIOR LIVE OAK GROUP

One association in the type

..... **Yellowpine-White Fir/Interior Live Oak** p.112

PINE/PINEMAT MANZANITA GROUP

One association in the type ..... **Washoe/Pinemat Manzanita** p.122

PINE/SPREADING SNOWBERRY GROUP

1 Jeffrey pine absent or scarce
..... **Ponderosa-White Fir/Spreading Snowberry** p.104

1' Not as above 2

2 Douglasfir present in regeneration, midstory layers
..... **Yellowpine-Douglasfir/Bitterbrush/Mulears** p.68

2' Not as above 3

3 Type is on non-granitic soils, with white fir regeneration
..... **Yellowpine-White Fir/Spreading Snowberry/Mulears** p.116

3' Type is on granitic soils 4

4 Wheeler bluegrass present to common.
..... **Jeffrey-White Fir/Bluegrass//GRANITE** p.92

4' Wheeler bluegrass absent or scarce
..... **Yellowpine/Bitterbrush/Butterweed//GRANITE** p.84

PINE/MOUNTAIN SNOWBERRY GROUP

1 Washoe pine is the dominant pine
..... **Washoe-White Fir/Snowberry/Starwort** p.124

1' Not as above 2

2 Ponderosa pine present to common 3

3 Jeffrey pine present .... **Yellowpine-White Fir/Serviceberry-Oregongrape** p.118

3 Jeffrey pine absent ..... **Ponderosa-White fir/Serviceberry-Oregongrape** p.100

2' Not as above 4

4 White fir present and reproducing successfully
..... **Jeffrey-White Fir/Snowberry/Bluegrass** p.94

4' Not as above 5

5 White fir absent, or rare in the stand
..... **Jeffrey/Bitterbrush-Snowberry/Bluegrass** p.64

5' Not as above
..... Retry the key, or try another group

PINE/MAHOGANY GROUP

1 Ponderosa pine absent or scarce. Mahogany cover high; rock cover greater than 15%
..... **Jeffrey/Mahogany** p.60

1' Not as above

2 Bluebunch wheatgrass present to common. Site is on or near the Brockman Lava Flow
..... **Yellowpine/Mahogany/Wheatgrass** p.76

2' Not as above 3

3 Jeffrey pine present. Mahogany and/or arrowleaf balsamroot present to common
..... **Yellowpine/Mahogany/Balsamroot** p.78

3' Not as above 4

4 Jeffrey pine absent or scarce. Idaho fescue present to abundant
..... **Ponderosa/Mahogany-Bitterbrush/Fescue** p.34

4' Not as above
..... Re-try the key, or try another group

PINE/SERVICEBERRY GROUP

1 Site has Jeffrey pine

2 Serviceberry, oregongrape present to common
..... **Yellowpine-White fir/Serviceberry-Oregongrape** p.118

2' Not as above 3

3 Lodgepole pine present to common in midstory and regen layers
..... **Ponderosa-White Fir-Lodgepole/Serviceberry** p.96

3' Not as above 4

4 White fir absent to scarce 5

5 Incensecedar present in regeneration, upper layers
..... **Ponderosa-Incesecedar/Bitterbrush-Serviceberry/Balsamroot** p.26

5' Not as above 6

6 Oregongrape, heartleaf arnica present to common
..... **Ponderosa/Serviceberry-Oregongrape/Arnica** p.30

6' Not as above 7

7 *Prunus* spp. present to common
..... **Ponderosa/Serviceberry-Prunus** p.32

4 White fir present and regenerating 9

9 Bitterbrush, snowbrush absent or scarce, and/or mountain snowberry may be present
..... **Ponderosa-White Fir/Serviceberry-Oregongrape** p.100

9 Not as above 10

10 Stand is on rocky lava flow, with *Prunus* spp. present to common
..... **Ponderosa-White Fir/Serviceberry-Snowbrush/Brome** p.102

10 Not as above. Site is on deep silt-loam soils
..... **Ponderosa-White Fir/Snowbrush/Needlegrass** p.106

PINE/SAGEBRUSH GROUP

1 Jeffrey pine absent or scarce ..... **Ponderosa/Mtn. Big Sagebrush/Fescue** p.34

1' Not as above 2

2 Idaho fescue present to abundant ..... **Jeffrey/Sagebrush/Fescue** p.58

2' Idaho fescue absent or scarce
..... **Yellowpine/Sagebrush-Bitterbrush** p.74

PINE/SNOWBRUSH-MANZANITA GROUP

1 White fir absent
..... **Ponderosa/Bitterbrush-Snowbrush-Manzanita/Brome** p.38

1' Not as above 2

2 Stand is in a rocky lava flow with *Prunus* shrubs present to common in the stand
..... **Ponderosa-White Fir/Snowbrush/Needlegrass** p.106

2' Not as above 3

3 Serviceberry and orcutt brome present to common
..... **Ponderosa-White Fir/Serviceberry-Snowbrush/Brome** p.102

3' Serviceberry absent to scarce, western needlegrass present to common
..... **Ponderosa-White Fir/Bitterbrush-Manzanita/Needlegrass** p.108

PINE/HUCKLEBERRY OAK GROUP

One association in the type
..... **Yellowpine-White Fir/Huckleberryoak/Mulears** p.110

PINE/BITTERBRUSH GROUP

1 White fir present to common in the midstory and regeneration layers 2

2 Site is a rocky lava flow, with *Prunus* spp. present to common
..... **Ponderosa-White Fir/Snowbrush/Needlegrass** p.106

2' Site not a lava flow; *Prunus* spp. absent or rare.
..... **Ponderosa-White Fir/Bitterbrush-Manzanita/Needlegrass** p.108

1' White fir absent or rare 3

3 Stand is on pumice soils
..... **Ponderosa/Bitterbrush/Needlegrass//PUMICE** p.50

3' Not as above 4

4 Idaho fescue common to well represented 5

5 Jeffrey pine present and reproducing successfully
..... **Yellowpine/Bitterbrush/Fescue** p.80

5' Jeffrey pine absent 6

6 Mountain mahogany present to common
..... **Ponderosa/Mahogany-Bitterbrush/Fescue** p.36

6' Mountain mahogany absent to scarce
..... **Ponderosa/Bitterbrush/Fescue** p.48

4' Idaho fescue absent to scarce 7

7 Jeffrey pine absent 8

8 Incensecedar present to common in regeneration; other layers
..... **Ponderosa-Incensecedar/Bitterbrush/Balsamroot** p.26

8' Not as above 9

9 Wax current present to common
..... **Ponderosa/Bitterbrush-Current/Brome** p.44

9' Not as above 10

10 Snowbrush and manzanita common to abundant
..... **Ponderosa/Bitterbrush-Snowbrush-Manzanita/Brome** p.38

10' Not as above 11

11 Chokecherry and/or serviceberry and/or sierra plum and/or mahogany present to common, in or near a lava flow 12

12 Bluebunch wheatgrass common grass
..... **Ponderosa/Bitterbrush/Prunus/Wheatgrass** p.42

12' Bluebunch wheatgrass absent
..... **Ponderosa/Bitterbrush-Prunus/Brome** p.40

11' Not as above 13

13 Western needlegrass, kellogia absent to scarce. Canby bluegrass, arrowleaf balsamroot present to common
..... **Ponderosa/Bitterbrush/Balsamroot** p.46

3' Western needlegrass, kellogia present to common. Bluegrass, balsamroot not present, or rare
..... **Ponderosa-White Fir/Bitterbrush-Manzanita/Needlegrass** p.108

7' Jeffrey pine present and reproducing successfully 14

14 Douglas fir present in midstory and regen layers
..... **Yellowpine-Douglas Fir/Bitterbrush/Mulears** p.68

14' Not as above 15

15 Serviceberry and/or arrowleaf balsamroot present to common
..... **Yellowpine/Mahogany/Balsamroot** p.78

15' Not as above 16

16 Ponderosa pine present 17

17 Coffeeberry present ..... **Yellowpine/Coffeeberry/Bluegrass** p.86

17' Not as above 18

18 Sagebrush present ..... **Yellowpine/Sagebrush-Bitterbrush** p.74

18' Not as above. Greenleaf manzanita present to common
..... **Ponderosa-White fir/Bitterbrush-Manzanita/Needlegrass** p.108

16' Ponderosa pine absent or rare in the stand 19

19 Mahogany, mountain big sagebrush present to common
..... **Jeffrey/Bitterbrush-Mahogany/Needlegrass** p.62

19' Not as above 20

20 Mulears common to abundant
..... **Jeffrey/Bitterbrush/Mulears** p.66

20' Not as above. Re-key the type, or try a different group. If serviceberry is present in the type, try the PINE/SERVICEBERRY group.

SERIES AND TYPE DESCRIPTIONS

PONDEROSA PINE SERIES

PONDEROSA PINE SERIES

DISTRIBUTION AND ENVIRONMENT

The Ponderosa Pine Series includes all forest stands currently dominated by ponderosa pine in the overstory and regeneration layers.

Ponderosa pine is shade-intolerant, so when the regeneration layer is dominated by this species, the overstory is almost always also composed of ponderosa pine.

Ponderosa pine series stands grow on relatively warm, low elevation sites compared to other stands in this report. Ponderosa pine series stands were compared with other series in this study by discriminant analysis, and the following differences were significant: compared to Jeffrey pine series stands, ponderosa pine series stands grow at lower elevation sites with flatter slopes, higher Available Water Holding Capacity (deeper, more organic soils);and a higher "moisture index", a transformation of AWC and precipitation.

Ponderosa pine stands also tend to have higher levels of total vegetation canopy cover, higher total basal area, precipitation, soil depth, and wood fiber productivity than Jeffrey pine series stands. Soil temperatures regime is usually mesic, in contrast to the often frigid soil temperature regimes in Jeffrey pine series.

Eleven plant associations and plant communities are described in the Ponderosa pine series.

SUBSERIES AND GROUPS

A subseries or group is defined as an aggregation of taxonomically related plant associations within a series that takes the name of that series followed by related species that are dominant, or that have indicator value across multiple plant associations.

The most widespread subseries in the Ponderosa pine series is the Ponderosa/bitterbrush subseries. This combination of tree and dominant shrub occupies a large proportion of the study area. The highest cover of bitterbrush is usually found on flat aspects with relatively deep soils. Precipitation is variable. Bitterbrush is relatively shade-intolerant, and cover tends to decrease with increased tree cover. Bitterbrush response to fire varies with time of exposure and flame intensity. Hot summer fires often exterminate bitterbrush stands, whereas cool spring burns with high soil moisture often result in bitterbrush sprouting. Fire exclusion has probably allowed bitterbrush densities to increase dramatically in some locales.

Another important subseries in the Ponderosa Pine subseries is the Ponderosa/mountain mahogany subseries. Mountain mahogany is found in varying amounts in many plant associations, but it reaches its highest expression in steep or rocky sites that are climatically or edaphically dry.

The Ponderosa/sagebrush subseries in this study were located on sites with higher elevations than other subseries, although southerly latitudes compensate somewhat for higher elevations. Mountain big sagebrush is also shade-intolerant, and cover of big sagebrush usually decreases dramatically at about sixty percent total tree cover.

The Ponderosa/Serviceberry subseries is found in sites with higher tree cover. Basal area is higher, and soils are deeper and more productive. Site index is higher. Shrubs are usually at a lower cover overall in this subseries. Other shrubs such as Prunus spp. and Rosa spp. are often found in this subseries, but serviceberry is the most consistent indicator shrub.

Ponderosa pine stands that are growing in association with spreading or mountain snowberry are often found on relatively high elevation, moist sites, usually in conjunction with white fir

regeneration.

Ponderosa pine stands with high cover of snowbrush and greenleaf manzanita have experienced hot fires and other favorable germination events sometime in the relatively recent past; probably in the last 30 to 50 years.

Ponderosa pine-black oak group stands are found at comparatively low elevation sites that have soil temperature regimes warm enough to allow black oak regeneration.

FIRE ECOLOGY

Warm, dry ponderosa pine associations and communities frequently border more open, shrub-dominated sites. Historical fire frequency in these drier types was probably 5-20 years prior to fire exclusion (Biswell 1972, Laudenslayer et al 1989, Hall 1977, Barrett 1988).

Frequent, low intensity underburns kept these communities open and parklike. Litter and larger fuels accumulations were low, and the frequent fires performed the function of maintaining the open stands, cycling nutrients, reducing pathogens, and facilitating infrequent, clumpy, even-aged natural pine regeneration.

Fire exclusion allows succession of small pines which often grow to pole or sapling size and stagnate at that level. Some stands have thousands of stems per acre. These suppressed understories provide fuel ladders to the overstory, and facilitate the spread of pathogens such as dwarf mistletoe, root diseases, and bark beetles. Mortality and fuel loading is high, and fires often escalate into stand-replacing conflagrations that the original stands hardly ever experienced.

Some investigators hypothesize (Cochrane 1991) that fire exclusion in these stands has enhanced wood fiber productivity because of the nutrients supplied to sites from decaying organic material which would formerly have burned up with frequent fires. This might be a valid conclusion on soils with inherent low productivity such as those with a thick pumice or ash overburdon.

See Appendix H for a generalized discussion of seral pathways with different fire scenarios.

PRODUCTIVITY/MANAGEMENT

Productivity within the Ponderosa pine series is variable. Predictive factors are mostly related to the ability of these sites to obtain and retain soil moisture. High precipitation, high elevation, or a combination contribute to higher stocking and wood productivity within the series. Some groups such as the Ponderosa/Serviceberry-Prunus association have relatively high wood fiber productivity because of landscape positioning that contributes added moisture to the site.

The more open shrub-dominated associations such as Ponderosa/Bitterbrush/Fescue and Ponderosa/Mountain Big Sagebrush/Fescue have relatively low wood production, but high browse and herbage production that is available for livestock and wildlife.

PONDEROSA-INCENSECEDAR/BITTERBRUSH/BALSAMROOT
PIPO-CADE3/PUTR/BASA1

CPPSBB11

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	51
PIPOM	Ponderosa pine, midstory	83	2
CADEM	Incensecedar, midstory	67	5
CADET	Incensecedar, overstory	33	25
Tree Understory Layer			
CADE3	Incensecedar	100	1
PIPO	Ponderosa pine	100	1
Shrubs			
PUTR	Bitterbrush	100	2
CEPR	Mahala mat	83	12
AMPA2	Western serviceberry	67	1
ARPA9	Greenleaf manzanita	50	1
Herbs			
BASA1	Arrowleaf balsamroot	100	2
HIHO	Shaggy hawkweed	100	1
AGRE2	Spearleaf mtn. dandelion	83	1
SEINM	Tower butterweed	83	1
LUCA2	Spurred lupine	67	7
CLRH	Forest clarkia	67	1
ARCO3	Heart-leaved arnica	50	25
CRAC2	Hawksbeard	50	2
WYMO	Mountain mulears	50	1
Grasses & Sedges			
SIHY	Squirreltail	100	2
CARO1	Ross' sedge	67	2
POCA3	Canby Bluegrass	50	1

Environment

Elev: 4895 (4560-5260)
Aspect: All
Slope: 12 (7-16)

Landform: Upper slopes and ridges.

R5 Site Class: 4 (3-4)

Special: Exposed sites with shallow soils, as indicated by CADE3.

Landscape Ecology and Environment

This plant association occurs on the northwest and west facing sideslopes of mountains, hills, and ravines. These exposures are often hotter, drier, and have shallower and more rocky soils than adjacent sites downslope or on moister, cooler aspects.

Vegetation

Overstory vegetation is dominated by ponderosa pine, with incensecedar being an obvious stand component, but less dominant than ponderosa pine. Regeneration is mostly ponderosa pine, with incensecedar regeneration present. The most dominant shrub vegetation is bitterbrush, and the large herbs balsamroot, wyethia, and spurred lupine are evident in the understory. Incensecedar occurs in pine stands that are slightly moister than pure ponderosa or Jeffrey pine stands, but not moist enough for mixed conifer species such as white fir. Incensecedar can tolerate hotter and dryer soil temperatures than can white fir, and is commonly found on upper or middle slopes and ridgetops that typically have shallower soils and lower water holding capacities than cooler and moister sites that commonly have white fir. Incensecedar is one of the few native trees in our area that supports vesicular-arbuscular mycorrhizae (western juniper is another species); all other coniferous trees in our area are ectomycorrhizal. This characteristic might have implications for seedling survival and growth.

Fire Ecology

These stands developed with low intensity ground fires. Ground fires have the effect of thinning trees, recycling nutrients, and interrupting fuel ladders. Seedling and sapling and pole incensecedar are adversely affected by ground fires, and the current expression of this species in the understories of these stands partially reflects fire history of the last 80 to 100 years. Greenleaf manzanita has potential to dominate this type following a high intensity fire.

Soils

Soils are moderately deep and deep, loamy-skeletal and fine, montmorillonitic Argixerolls, in the Elmore, Lawyer, Jacket and Keating families. Available water holding capacity ranges from 2 to 4 inches in the top 20 inches of soil.

Productivity and Management

The tree productivity of this type splits distinctly on soil depth. Soils less than 36" deep (moderately deep) are less productive than deep soils (greater than 41" deep). Deeper soils have higher available water holding capacities and moderate to high seedling survival potentials.

PONDEROSA-BLACK OAK/BITTERBRUSH/NEEDLEGRASS
PIPO-QUKE/PUTR/STOC1 **CPPSBB12**

Vegetation Summary Table
(Sample Size: 4)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	31
CADET	Incensecedar, overstory	50	5
PIPOM	Ponderosa pine, midstory	50	1
Tree Understory Layer			
CADE3	Incensecedar	100	5
PIPO	Ponderosa pine	75	1
QUKE	California black oak	75	1
Shrubs			
ARPA9	Greenleaf manzanita	100	10
CEPR	Mahala mat	75	13
PUTR	Bitterbrush	75	2
CELE3	Curlleaf mountain mahogany	75	1
RIRO	Sierra gooseberry	50	1
RHRUM	Modoc coffeeberry	50	1
CEIN	Deerbrush	50	1
Herbs			
APPU	Mountain hemp	75	1
LUCA2	Tailcup lupine	50	1
CAAP	Applegate's paintbrush	50	1
MACA1	Hoaryaster	50	1
HECAN	Sierra helianthella	25	2
Grasses & Sedges			
SIHY	Squirreltail	100	1
STOC1	Western Needlegrass	75	1
CAMU1	Manystem sedge	50	1

Environment

Elev: 3660 (3380-3880)
Aspect: All
Slope: 0 (0- 0)

Landform: Plateaus and benches, undulating lava flows.

R5 Site Class: 4 (3-5)

Special: Black oak is an important component of species diversity in the type.

Landscape Ecology and Environment

This plant association occurs in and near the Timbered Crater Lava Flow area, Hat Creek District, Lassen National Forest. The type is found on or between relatively recent lava flows in reef-like formation on nearly level to gently sloping basalt plateaus.

Vegetation

Dominant overstory vegetation is ponderosa pine, accompanied by incense cedar and western juniper, with smaller amounts of black oak. Regeneration consists of the same species. Understory shrub cover is high, and consists of relatively high cover values of bitterbrush, mountain mahogany, Modoc coffeeberry, and deerbrush. Mountain hemp, tailcup lupine, and western needlegrass are common in the herbaceous layer.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is more open and parklike than at present, with fewer shrubs and probably more herbaceous vegetation. High intensity fire now will result in an increase of fire sprouting shrubs such as deerbrush and greenleaf manzanita, and a decrease in fire-sensitive shrubs such as bitterbrush, mountain mahogany, and Sierra gooseberry. Black oak crown sprouts when burned. The lava reef setting tends to form natural fire breaks because of discontinuous fuels, and fires will tend to burn in mosaic patterns.

Soils

In a typical lava reef setting, hard fractured vesicular basalt rock makes up 20 to 35 percent of the land area. Another 25 to 40 percent of the area is composed primarily of shallow skeletal soils which overcap fractured basalt bedrock. The remaining 30 to 40 percent of the land area will be in isolated 0.1 to 2.0 acre flower-pot like depressions between the hummocky broken lava flow rock. Soils in this type are classified as medial-skeletal, mesic, Andic Xerochrepts and Xerumbrepts, in the Neer and Washougal families.

Productivity and Management

Average site productivity is estimated at less than 20 ft^3/ac/yr at CMAI or GBA on the lava flows and shallow soils, and about 30 ^{f}/ac/yr at CMAI or GBA on the moderately deep to deep soils in the depressions between the rock reef outcrops. This plant association is an important winter range for deer. Major forage species include bitterbrush, deerbrush, mahala mat, mountain mahogany, and birchleaf mountain mahogany. Black oak foliage and mast provides important forage for a number of wildlife species, including deer, tree squirrels, birds, and insects. Black oak is a significant component of species and structural diversity on this site.

PONDEROSA/SERVICEBERRY-OREGONGRAPE/ARNICA
PIPO/AMPA2-BERE/ARCO3

CPPSAM11

Vegetation Summary Table
(Sample Size: 12)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa Pine, overstory	100	56
PIPOM	Ponderosa Pine, midstory	50	9
JUOCM	Western juniper, midstory	42	3
Tree Understory Layer			
PIPO	Ponderosa Pine	100	2
JUOC	Western juniper	58	2
Shrubs			
AMPA2	Western serviceberry	100	4
CEPR	Mahala mat	92	6
BERE	Oregongrape	83	1
ROWOU	Interior rose	58	2
CELE3	Curlleaf mountain mahogany	50	2
PUTR	Bitterbrush	50	1
PRVI	Chokecherry	33	3
PREM	Bitter cherry	25	1
Herbs			
ARCO3	Heart-leaved Arnica	83	5
CLRH	Forest clarkia	83	1
HIHO	Shaggy hawkweed	67	1
SEINM	Tower butterweed	67	1
WYMO	Mountain mulears	58	2
SOMU	Northern goldenrod	58	2
MINU1	Nodding microseris	58	1
CRAC2	Hawksbeard	50	1
BASA1	Arrowleaf balsamroot	42	2
Grasses & Sedges			
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	100	1
PONE1	Wheeler bluegrass	67	1
POCA3	Canby bluegrass	50	1
BROR1	Orcutt brome	50	1

Environment

Elev: 5332 (5200-5520)
Aspect: All
Slope: 11 (3-21)

Landform: Scarp offsets; upper and middle slopes of mountains.

R5 Site Class: 3 (2-5)

Special: Mesic type, productive. Interior rose indicates proximity to intermittant or perennial riparian area.

Landscape Ecology and Environment

This plant association is found on level to moderately sloping hill and mountain sideslopes, and on sloping offsets from basalt plateau scarp breaks. The type was sampled in the Modoc Plateau and Warner Mountain physiographic regions. Elevations range from 5200 to 5520 feet. The scarp break sites are usually adjacent to stony low sage scab flats, and these scarp break sites are positioned to receive additional ground moisture drained from the adjacent flats. Average annual precipitation is 20 inches.

Vegetation

Dominant tree vegetation is ponderosa pine, which is also the primary regenerating species. Understory vegetation is diverse and includes western serviceberry, snowbrush, interior rose, mountain mahogany, bitterbrush, heartleaf arnica and wheeler bluegrass. Canopy closure and tree density can be high for Eastside Pine. Interior rose indicates additional moisture on the site, either from juxtaposition to ephemeral or perennial riparian areas or from subterranean drainage from adjacent basalt flows. Mechanically disturbed stands have little or no heartleaf arnica, and other herbaceous species are reduced as well. Heartleaf arnica is a well-known medicinal herb used externally for reducing inflammations.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is more open and parklike, with fewer shrubs and probably more herbaceous vegetation. White fir succession will eventually appear in some sites with continued fire exclusion. These sites have potential for an increase in snowbrush density if subjected to a hot fire. Serviceberry, wood rose, bitter cherry and chokecherry will resprout following low and moderate intensity fires.

Soils

Soils are moderately deep to deep. Bedrock geology is primarily hard fractured basalt. Available water holding capacity is relatively high, ranging from 2 to 3 inches in the top 20 inches of soil. Soils are classified as mostly mesic temperature regime, and are Pachic Ultic Argixerolls and Haploxeralfs.

Productivity and Management

Regeneration potential for natural regeneration or planted tree seedlings is normally moderate to high. Stand size may be limiting as the scarp break sites are often small. These stands are floristically and structurally rich and diverse, and they provide nesting, feeding, and hiding habitat for a number of passerine birds, raptors, rodents, deer, antelope, etc. Their juxtaposition to basalt scab flats makes them especially important for structural diversity.

PONDEROSA/SERVICEBERRY-PRUNUS
PIPO/AMPA2-PRUNUS

CPPSAM12

Vegetation Summary Table
(Sample Size: 25)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	60
PIPOM	Ponderosa pine, midstory	100	7
JUOCM	Western juniper, midstory	72	4
Tree Understory Layer			
JUOC	Western juniper	92	2
PIPO	Ponderosa pine	88	2
Shrubs			
CEPR	Mahala mat	84	7
AMPA2	Western serviceberry	84	3
PUTR	Bitterbrush	72	2
PRVI	Chokecherry	56	3
ROWOU	Interior rose	52	2
PRSU2	Sierra plum	52	2
CELE3	Curlleaf mountain mahogany	50	2
ARPA9	Greenleaf manzanita	32	6
Herbs			
WYMO	Mountain mule ears	72	3
CRAC2	Hawksbeard	64	1
BASA1	Arrowleaf balsamroot	48	5
LOM1	Lomatium	48	1
LANE	Sierra nevada pea	40	1
CLRH	Forest clarkia	40	1
SEINM	Tower butterweed	40	1
Grasses & Sedges			
SIHY	Squirreltail	96	2
CARO1	Ross' sedge	80	1
1FEID	Idaho fescue	60	2
POCA3	Canby bluegrass	56	1
PONE1	Wheeler bluegrass	40	2

Environment

Elev: 4954 (4170-5400)
Aspect: All
Slope: 12 (2-47)

Landform: Scarp offsets; upper and middle slopes of mountains.

R5 Site Class: 3 (1-4)

Special: Mesic type, productive. Interior rose indicates proximity to intermittant or perennial riparian area.

Landscape Ecology and Environment

This plant association occurs on sideslopes of hills and mountains and on the tilted sideslopes of basalt plateau scarp breaks. This type also often occurs as a flat, small timbered stringer adjacent to a vernally moist, level, low sage scab flat. These sites occur in the Modoc Plateau Geomorphic Province. Slopes range from flat to almost 50 percent, on all aspects.

Vegetation

Ponderosa pine is the dominant tree and the primary regenerating species. Western juniper is present in the type largely as an artifact of fire exclusion. Understory vegetation is diverse and includes western serviceberry, interior rose, mountain mahogany, bitterbrush, and usually at least one of the *Prunus* species. Canopy closure and tree density can be high for Eastside pine. Interior rose indicates additional moisture on the site, either from juxtaposition to ephemeral or perennial riparian areas or from subterranean drainage from adjacent basalt flows. Pinedrops (*Pterospora andromodea*) indicates healthy mycorrhizal activity. Wheeler bluegrass and orcutt brome occur at the higher elevation end of the type (>5000'); canby bluegrass occurs at the lower elevation range (<4900). Creeping snowberry indicates higher precipitation and higher elevation.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is more open and parklike, with fewer shrubs and probably more herbaceous vegetation. White fir succession will eventually appear in some sites with continued fire exclusion. These sites have potential for an increase in greenleaf manzanita and possibly snowbrush density if subjected to a hot fire. Serviceberry, wood rose, bitter cherry and chokecherry will resprout following low and moderate intensity fires. Nonsprouting trees and shrubs in the type are western juniper, bitterbrush and mountain mahogany. These species can be expected to decrease in cover following a burn of moderate to high intensity.

Soils

Soils are deep and have high available water holding capacity. Bedrock geology is primarily hard fractured basalt or andesite, or soft volcanic tuff. Soil taxa include Pachic Ultic Argixerolls and Ultic Haploxeralfs, in the Elmore, Hiibner, Holland, Jacket, Lawyer, and Marcola families.

Productivity and Management:

Regeneration potential is high. These sites are good candidates for uneven-aged strategies because of their small size and high structural and species diversity values for pronghorn, deer, passerine birds, raptors, etc. Thick duff layers may smother herbaceous vegetation. Low intensity underburns that leave the fermentation layer intact might augment nutrient cycling, and might allow the understory to diversify.

PONDEROSA/MOUNTAIN BIG SAGEBRUSH/FESCUE
PIPO/ARTRV/FEID

CPPSSB11

Vegetation Summary Table
(Sample Size: 9)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	36
PIPOM	Ponderosa pine, midstory	100	11
JUOCM	Western juniper, midstory	Occasional	
Tree Understory Layer			
PIPO	Ponderosa Pine	89	2
JUOC	Western juniper	Occasional	
Shrubs			
ARTRV	Mountain big sagebrush	100	5
HABL	Bloomer goldenbush	89	1
CEPR	Mahala mat	56	2
ARPA9	Greenleaf manzanita	44	1
Herbs			
WYMO	Mountain mule ears	44	2
LUCA2	Spurred lupine	33	1
PESE3	Pine lousewort	44	1
LUCA2	Spurred lupine	33	1
Grasses & Sedges			
FEID	Idaho fescue	100	8
CARO1	Ross' sedge	89	2
SIHY	squirreltail	89	1
STOC1	Western needlegrass	78	2

Environment

Elev: 5662 (5580-5700)
Aspect: All
Slope: 4 (1-7)

Landform: Lower colluvial slopes.

R5 Site Class: 3 (3-4)

Special: Big sagebrush is shade-intolerant.

Landscape Ecology and Environment

This plant association is found on nearly level to gently sloping mountain sideslopes, alluvial fans, and basalt plateaus on slopes of 0 to 10 percent. Elevation ranges from 5580 to 5700 feet and average estimated annual precipitation ranges from 20 to 40 inches. The type occurs throughout the study area as an interface between forest types with higher tree canopy cover and open rangelands. Big sagebrush is intolerant of shade and decreases in cover with increased tree canopy cover.

Vegetation

Dominant tree vegetation is ponderosa pine, which is also the primary regenerating tree species. Understory vegetation consists of an open mountain big sagebrush stand with 1 to 20 percent cover of Idaho fescue. Greenleaf manzanita is present on moister sites.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer seedling, sapling, and pole-sized trees, fewer shrubs, and higher cover of herbaceous vegetation. Mountain big sagebrush is easily killed by fire. Greenleaf manzanita will sprout following hot fires, and also germinate from seed where a seed bank is present. Excluding ground fires or lack of thinning can lead to the development of "doghair thickets" of small, suppressed ponderosa pines with very little understory. These thickets are highly susceptible to high intensity wildfire and organisms such as dwarf mistletoe and mountain pine beetle.

Soils

Soils are moderately deep to deep and are normally loamy-skeletal or fine-loamy Mollisols (Ultic Argixerolls or Ultic Haploxerolls). Bedrock geology is hard to soft basalt or andesite.

Productivity and Management

Soils do not limit mechanical site preparation. Seedling survival potential is relatively high due to the water holding capacity in the top 20 inches of soil. Shelterwood and selection cutting methods should work well where stands are not infected with dwarf mistletoe. This type is used extensively by domestic livestock for forage and shading in early and late successional stages due to the open, grassy nature of the understory vegetation.

PONDEROSA/MAHOGANY-BITTERBRUSH/FESCUE
PIPO/CELE3-PUTR/FEID

CPPSBB13

Vegetation Summary Table
(Sample Size: 12)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa Pine, overstory	100	46
JUOCM	Western juniper, midstory	58	3
PIPOM	Ponderosa Pine, midstory	42	4
CADET	Incensecedar, overstory	25	4
Tree Understory Layer			
JUOC	Western juniper	100	1
PIPO	Ponderosa Pine	50	1
Shrubs			
CELE3	Curlleaf mountain mahogany	100	1
PUTR	Bitterbrush	92	8
CEPR	Mahala mat	67	2
AMPA2	Greenleaf manzanita	42	1
Herbs			
CLRH	Forest clarkia	83	1
PHDI4	Spreading phlox	75	1
COLI2	Slenderleaf collomia	67	1
ERLA6	Common woolysunflower	67	1
ERINI	California rayless daisy	50	1
PECI1	Ashy penstemon	42	1
Grasses & Sedges			
FEID	Idaho fescue	100	5
CARO1	Ross' sedge	100	1
SIHY	Squirreltail	83	1
POSA3	Sandberg Bluegrass	75	1

Environment

Elev: 4918 (4520-5480)
Aspect: All
Slope: 16 (0-42)

Landform: Mountaintops, upper and middle slopes.

R5 Site Class: 4 (3-5)

Special: Mtn. mahogany indicates rocky soils.

Landscape Ecology and Environment

This plant association is found on level to undulating basalt plateaus and on mountain sideslopes and rock outcroppings on basalt plateaus. The appearance of the type is open pine forest, with an understory of bitterbrush, mountain mahogany, and idaho fescue. The type was sampled on the sideslopes of shield and dome volcanic mountains on the Goosenest Ranger District, Klamath National Forest, although the type also occurs elsewhere. This type is commonly found upslope of the Ponderosa/Bitterbrush/Fescue type, in shallower and stonier soils.

Vegetation

Dominant overstory tree vegetation is ponderosa pine. Ponderosa pine and western juniper are the regenerating tree species. Mountain mahogany is always present in the shrub understory, and indicates stony or shallow soils. Bitterbrush is canopy dominant in the shrub layer. Idaho fescue has medium to high cover in all plots.

Fire Ecology

Older stands in this type developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer shrubs and probably more herbaceous vegetation. Species that have increased in density and cover with fire exclusion include western juniper, bitterbrush, and mountain mahogany. Greenleaf manzanita can aggressively dominate this type following a high intensity fire.

Soils

Soils are moderately deep loams and sandy loams, and coarse fragment percent is high. Available water holding capacity at 20 inches ranges from 2 to 3 inches. Soils are mostly classified as fine-loamy and loamy-skeletal mixed, mesic, Pachic Ultic Argixerolls.

Productivity and Management

Productivity for wood fiber and tree regeneration is directly related to soil depth. The less productive phase occurs on mountain sideslopes, on shallow stony soils. Suitability for intense management activities such as site preparation, tree planting, etc. is limited by the high rock content. This type contains several important wildlife browse species, including bitterbrush, mountain mahogany, and mahala mat. This plant association provides important deer habitat during all seasons of the year.

PONDEROSA/BITTERBRUSH-SNOWBRUSH-MANZANITA/BROME
PIPO/PUTR-CEVE3-ARPA9/BROR1 **CPPSBB14**

Vegetation Summary Table
(Sample Size: 19)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	44
PIPOM	Ponderosa pine, midstory	68	4
PIPOM	White fir, midstory	26	1
CADEM	Incensecedar, midstory	16	3
Tree Understory Layer			
PIPO	Ponderosa Pine	95	3
Shrubs			
CEVE3	Snowbrush	100	12
ARPA9	Greenleaf Manzanita	100	8
PUTR	Bitterbrush	89	26
HABL	Bloomer Goldenbush	79	3
AMPA2	Western serviceberry	74	1
PRSU2	Sierra Plum	68	3
PRVI	Chokecherry	53	1
RHRUM	Modoc coffeeberry	47	1
CEPR	Mahala mat	42	5
PREM	Bitter cherry	32	1
Herbs			
HOFUP	Dusky Horkelia	63	2
KEGA	Kellogia	58	1
MOODG	Mountain monardella	53	2
SEAR	California butterweed	42	1
ERINI	California rayless daisy	42	1
VIPU	Mountain violet	42	1
Grasses and Sedges			
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	89	2
CARO1	Ross' sedge	79	1
BROR1	Orcutt Brome	68	1
CABR5	Short sedge	21	2

Environment

Elev: 4396 (3640-4830)
Aspect: All
Slope: 2 (0-10)

Landform: Plateaus and benches, undulating lava flows.

R5 Site Class: 2 (1-5)

Special: Plant Community. High cover of fire-sprounting shrubs indicates relatively recent fire history.

Landscape Ecology and Environment

This plant community is found on mainly level basalt plateaus with a relatively recent thick deposit of pyroclastic cinders and ash from volcanic mud flows. The plant community is also found on rocky basalt flows without an ash overburden. Additional moisture is available to some of these sites from drainage from non-vegetated lava flows that are often adjacent.

Vegetation

The dominant overstory tree vegetation is ponderosa pine. White fir and incense cedar are occasionally present in the middle and lower layers. The dominant regenerating tree is ponderosa pine. Shrub cover is usually high, and is dominated by snowberry, greenleaf manzanita, and bitterbrush. Bloomer goldenbush, serviceberry, and sierra plum also occur in the shrub layer. The most constant herbaceous species in the type are dusky horkelia, kellogia, orcutt brome, and western needlegrass.

Fire Ecology

Both greenleaf manzanita and snowbrush are seral following hot fires. The high abundance of these species indicate a hot fire and good seed germination conditions some time in the last 80 years or so. Both snowbrush and greenleaf manzanita are relatively shade intolerant, and can be expected to decrease in cover as these stands age and develop higher overstory canopy closure. Snowbrush is a nitrogen-fixing shrub, and litter and below-ground root biomass of snowbrush helps build organic matter in soils that have experienced high temperatures. "Potential Natural Community" for these sites is surmised to be Ponderosa/Bitterbrush/Brome.

Soils

Soils are in the Germany and Washougal families, and are formed in basalt, cinders, and ash. Soils classify as Andic and Lithic Pachic Xerumbrepts. Soil depth is mostly greater than 40 inches, and available water holding capacity is high, averaging 3 inches in the top 20 inches of soil.

Productivity and Management

Tree productivity is moderate to high on these sites when compared to other Eastside Pine communities. The community occurs on sites that vary from non-rocky to extremely rocky, and, as can be expected, the non-rocky sites are the most productive. This plant community provides abundant browse and hiding cover for deer, black bear, and other species..

PONDEROSA/BITTERBRUSH-PRUNUS/BROME
PIPO/PUTR-PRUNUS/BROR1

CPPSBB15

Vegetation Summary Table
(Sample Size: 7)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	57
PIPOM	Ponderosa pine, midstory	100	2
Tree Understory Layer			
PIPO	Ponderosa pine	100	1
Shrubs			
PUTR	Bitterbrush	100	21
CEPR	Mahala mat	100	2
ARPA9	Greenleaf manzanita	86	2
AMPA2	Western serviceberry	71	3
HABL	Bloomer goldenbush	71	1
PRSU2	Sierra plum	57	1
RICE	Wax current	57	1
PRVI	Chokecherry	43	1
RHRUM	Modoc coffeeberry	43	1
Herbs			
MOODG	Mountain monardella	86	2
PHDI4	Spreading phlox	86	2
KEGA	Kellogia	86	1
CAAP	Applegate paintbrush	71	1
HOFUP	Dusky horkelia	57	1
LANE	Sierra nevada pea	57	1
FRPL	Scarlet strawberry	57	1
CLRH	Forest clarkia	57	1
ERINI	California rayless daisy	43	1
SEAR	California butterweed	43	1
Grasses and Sedges			
SIHY	Squirreltail	100	2
CARO1	Ross' sedge	100	1
BROR1	Orcutt Brome	86	1
STOC1	Western needlegrass	57	1
MEBU2	Bulbous melic	43	1

Environment

Elev: 4400 (4300-4680)
Aspect: All
Slope: 5 (0-15)

Landform: On and adjacent to basalt lava flows, Modoc Plateau.

R5 Site Class: 3 (1-3)

Special: Orcutt brome is a mesic site indicator.

Landscape Ecology and Environment

This plant association was sampled in and near the Long Bell State Game Refuge, Modoc National Forest. The type is found on or between relatively recent lava flows in reef-like formations on nearly level to gently sloping basalt plateaus.

Vegetation

Older stands are dominated by ponderosa pine, which is also the primary regenerating species. Understory shrub and herbaceous vegetation is richly diverse probably due to the variety of microsites that occur on weathered basalt lava flows. Bitterbrush cover is high, ranging from 5 to 30 percent, and a variety of additional shrub species are present, including western serviceberry, chokecherry, Sierra plum, wax current, and Modoc coffeeberry. Forb and grass species with high constancy include mountain monardella, spreading phlox, and Orcutt brome. Orcutt brome indicates mesic climate conditions.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer shrubs and probably more herbaceous vegetation. The type has potential for high cover of greenleaf manzanita following a hot fire. Historical fire patterns are patchy because fuels are discontinuous in these complex lava reef environments.

Soils

Soils are classified as Ultic Argixerolls and Andic and Lithic Xerumbrepts, in the Fordice, Germany, and Washougal families. Available water holding capacity in the lithic soils can be less than 1.0 inches. Available water holding capacity in the "flower pot" depressions ranges from 2 to 5 inches in the top 40 inches of soil.

Productivity and Management

Tree seedling plantability is difficult in all but the "flower pot" depressions between the exposed lava rock outcrops due to rockiness and little or no soil. Tree regeneration potential in the deeper soils is moderate or high. The "flower pot" depressions are often ideal habitat for digging rodents such as pocket gophers and Belding ground squirrels, and their digging and foraging activities can affect tree seedling survival. Uneven-aged management would be a favored tree harvesting strategy in this type. The type is valuable mule deer habitat because of the diversity of browse species, and because of the high hiding and thermal cover.

PONDEROSA/BITTERBRUSH-PRUNUS/WHEATGRASS
PIPO/PUTR-PRUNUS/AGSP

CPPSBB16

Vegetation Summary Table
(Sample Size: 7)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	47
PIPOM	Ponderosa pine, midstory	86	4
Tree Understory Layer			
PIPO	Ponderosa pine	100	1
Shrubs			
PUTR	Bitterbrush	100	14
AMPA2	Western serviceberry	86	1
RICE	Wax current	86	1
HABL	Bloomer goldenbush	71	1
PRVI	Chokecherry	71	1
CELE3	Curlleaf mtn mahogany	57	3
CEPR	Mahala mat	57	2
Herbs			
LANE	Sierra nevada pea	100	1
HIHO	Shaggy hawkweed	86	2
CRAC2	Hawksbeard	86	1
ERLA6	Common woollysunflower	86	1
PHDI4	Spreading phlox	71	1
HOTR1	Threetooth horkelia	71	1
CLRH	Forest clarkia	71	1
VIPU	Mountain violet	71	1
ERINI	California rayless daisy	57	1
SEAR	California butterweed	57	1
AGUR	Nettle-leaved horsemint	57	1
Grasses & Sedges			
SIHY	Squirreltail	100	2
CARO1	Ross' sedge	100	1
AGSP	Bluebunch wheatgrass	100	1
BROR1	Orcutt brome	100	1
STOC1	Western needlegrass	57	1

Environment

Elev: 4271 (4240-4360)
Aspect: All
Slope: 2 (0-15)

Landform: On and adjacent to basalt lava flows, Modoc Plateau.

R5 Site Class: 3 (3-4)

Special: Bluebunch wheatgrass indicates drier site.

Landscape Ecology and Environment

This plant association was sampled in and near the Long Bell State Game Refuge, Modoc National Forest. The type is found on or between relatively recent lava flows in reef-like formations on nearly level to gently sloping basalt plateaus.

Vegetation

Older stands are dominated by ponderosa pine, which is also the primary regenerating species. Understory shrub and herbaceous vegetation is diverse probably due to the variety of microsites that occur on weathered basalt lava flows. Bitterbrush cover is high, ranging from 8 to 21 percent, and a variety of additional shrub species are present, including western serviceberry, chokecherry, wax current, and mountain mahogany. Forb and grass species with high constancy include sierra Nevada pea, shaggy hawkweed, hawksbeard, and common woolly sunflower. Bluebunch wheatgrass appears in conjunction with Orcutt brome in the grass layer, and indicates drier site conditions than the moister areas to the west.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer shrubs and probably more herbaceous vegetation. Lava reef environments exhibit variable fire behavior and fire history patterns because of the discontinuous fuels caused by the intermittent rock outcrops.

Soils

Soils are classified as Ultic Argixerolls and Andic and Lithic Xerumbrepts, in the Germany, and Ledmount families. Available water holding capacity in the lithic soils can be less than 1.0 inches. Available water holding capacity in the "flower pot" depressions ranges from 2 to 5 inches in the top 40 inches of soil.

Productivity and Management

Tree seedling plantability is difficult in all but the "flower pot" depressions between the exposed lava rock outcrops due to rockiness and little or no soil. Tree regeneration potential in the deeper soils is moderate or high. The "flower pot" depressions are often ideal habitat for digging rodents such as pocket gophers and Belding ground squirrels, and their digging and foraging activities can affect tree seedling survival. Uneven-aged management would be a favored tree harvesting strategy in this type. The type is valuable mule deer habitat because of the diversity of browse species, and because of the high hiding and thermal cover.

PONDEROSA/BITTERBRUSH-CURRENT/BROME
PIPO/PUTR-RICE/BROR1

CPPSBB17

Vegetation Summary Table
(Sample Size: 7)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	48
PIPOM	Ponderosa pine, midstory	14	2
ABCOM	White fir, midstory	14	2
PICOT	Lodgepole pine, overstory	7	5
Tree Understory Layer			
PIPO	Ponderosa pine	100	2
Shrubs			
RICE	Wax current	100	3
PUTR	Bitterbrush	86	17
HABL	Bloomer goldenbush	86	4
AMPA2	Western serviceberry	71	2
CEPR	Mahala mat	43	2
ARPA9	Greenleaf manzanita	43	1
Herbs			
VIPU	Mountain violet	86	1
HOFUP	Dusky horkelia	64	3
KEGA	Kellogia	57	1
SEAR	California butterweed	57	1
Grasses & Sedges			
SIHY	Squirreltail	86	2
BROR1	Orcutt Brome	50	1
STOC1	Western needlegrass	43	2

Environment

Elev: 4578 (3750-4720)
Aspect: All
Slope: 5 (0-10)

Landform: On and adjacent to weathered pyroclasitic mud flows.

R5 Site Class: 1 (0-2)

Special: Orcutt brome is a mesic site indicator.

Landscape Ecology and Environment

This plant community was sampled on the "McCloud Flats" and Toad area of the McCloud Ranger District, Shasta-Trinity National Forest. The type has been extensively logged since late in the 19th century. Tree age is for the most part less than 130 years, and total tree cover is still relatively low. White fir may eventually appear in these sites when tree canopy closure is higher. Site class is 0 or 1, and these sites are among the most productive of the sampled Eastside Pine associations and communities. These sites are considered communities because of the young tree age, and because of the seral nature of wax current. Wax current often increases density on sites with soil disturbance (such as that caused by logging), and decreases density with fire.

Vegetation

Vegetation consists of young and mature ponderosa pine stands with a shrub understory that consists of high cover values of bitterbrush with wax current as a codominant shrub. Squirreltail cover is high in the herbaceous layer, indicating past surface disturbance that probably altered soil nutrient cycling.

Fire Ecology

These stands for the most part have not burned since they were logged in the last 80 to 100 years: Prelogging stand structure is suggested by the presence of old, decomposed, large diameter ponderosa pine stumps. This preexisting forest almost certainly developed with frequent underburning. Fire in these stands now would increase the herbaceous component at the expense of the shrubs. Neither wax current nor bitterbrush respond well to fire, and both shrubs could be expected to decrease. Greenleaf manzanita and Bloomer goldenbush could probably dominate these sites following hot fires.

Soils

Soils are in the Germany and Washougal families and are formed from basalt, cinders and ash. Soils classify as medial and medial-skeletal mesic, Andic Xerumbrepts.

Productivity and Management

Potential for artificial tree regeneration is high because of the deep, loamy soils on flat aspects. Much of the area occupied by this community has already been clearcut and planted to ponderosa pine. Bloomer goldenbush is an aggressive competitor with planted trees on these sites, and can form an almost closed canopy. Gophers contribute to high seedling mortality on these sites because of ideal conditions for digging, denning, and foraging.

PONDEROSA/BITTERBRUSH/BALSAMROOT
PIPO/PUTR/BASA1

CPPSBB18

Vegetation Summary Table
(Sample Size: 12)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	46
PIPOM	Ponderosa pine, midstory	58	6
JUOCM	Western juniper, midstory	50	3
Tree Understory Layer			
PIPO	Ponderosa pine	100	2
JUOC	Western juniper	67	1
Shrubs			
PUTR	Bitterbrush	100	8
CEPR	Mahala mat	100	7
ARPA9	Greenleaf manzanita	67	1
CELE3	Mountain mahogany	25	1
Herbs			
BASA1	Arrowleaf balsamroot	100	4
SEINM	Tower butterweed	100	1
ANLU2	Silvery-brown pussytoes	92	1
CRAC2	Hawksbeard	83	1
WYMO	Mountain mulears	75	2
CLRH	Forest clarkia	75	1
CAAP	Applegate's paintbrush	50	1
AGRE2	Spearleaf mtn. dandelion	50	1
Grasses & Sedges			
CARO1	Ross' sedge	100	3
SIHY	Squirreltail	100	2
POSA3	Canby bluegrass	100	2
STLE3	Letterman stipa	58	2

Environment

Elev: 5013 (4870-5200)
Aspect: All
Slope: 2 (0- 4)

Landform: On level Miocene weathered basalt lava flows.

R5 Site Class: 4 (3-4)

Special: Mtn. mahogany indicates stony soils. Spurred lupine indicates past logging disturbance.

Landscape Ecology and Environment

This plant association is found on Miocene weathered lava flows on the Modoc Plateau Geomorphic province. This large area is mostly level to undulating, often with deep soils. Annual precipitation averages 16 inches. The appearance of older stands in this type is "classic" Eastside Pine, with large, widely spaced yellow-barked ponderosa pine trees with an open shrub understory. This plant association is strikingly attractive in the spring and early summer when the arrowleaf balsamroot, tailcup lupine, and bitterbrush are in bloom.

Vegetation

Overstory vegetation is ponderosa pine, which is also the dominant regenerating species. Western juniper is also present and regenerating. The shrub understory consists of moderate to high cover values of bitterbrush, depending on site disturbance. The most obvious plants in the herbaceous understory are arrowleaf balsamroot and tower butterweed. Mountain mulears and spurred lupine are often present, and cover values of these species increases with increased site disturbance. Younger stands in the type can develop into "doghair thickets" in the absence of underburning or thinning. Arrowleaf balsamroot and mountain mulears indicate well-drained soils. Mountain mahogany indicates stonier soils in the type. Mountain big sagebrush may invade these sites with severe soil surface disturbance, such as that caused by fire and windrow-type site preparation.

Fire Ecology

Older stands in this plant association developed with frequent, low intensity ground fires. Fire return interval was probably 10 to 20 years on most sites. Shrub densities were probably lower with more frequent fire, and snag and log densities were patchy. Fire exclusion has allowed increased densities of small diameter understory pine and western juniper. Many sites now have fuel ladders into the canopies of the larger trees. These sites are now candidates for catastrophic stand replacing fires. Greenleaf manzanita has potential to dominate following hot fires.

Soils

Soils are in the Lawyer and Elmore families, and are fine-loamy and loamy-skeletal mixed, mesic, Pachic Ultic Argixerolls. Soils are normally greater than 40 inches deep over soft weathered vesicular basalt. Soils are fertile and productive, and are limited by amount of effective moisture throughout the growing season.

Productivity and Management

Reforestation potential is moderate or high. Canopy opening and severe soil surface disturbance may allow increased cover of mountain big sagebrush. This plant association provides important habitat for big game species in all seasons of the year. Raptors such as goshawk nest in the type readily especially when the type is close to ephemeral or permanent riparian areas. This plant association is used extensively by domestic livestock.

PONDEROSA/BITTERBRUSH/FESCUE
PIPO/PUTR/FEID

CPPSBB19

Vegetation Summary Table
(Sample Size: 30)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	45
PIPOM	Ponderosa pine, midstory	70	6
Tree Understory Layer			
PIPO	Ponderosa pine	70	1
JUOC	Western juniper	23	1
Shrubs			
PUTR	Bitterbrush	100	12
HABL	Bloomer goldenbush	73	1
CEPR	Mahala mat	57	7
Herbs			
LUCA2	Spurred lupine	37	1
WYMO	Mountain mulears	27	1
Grasses & Sedges			
FEID	Idaho fescue	100	5
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	93	2
STOC1	Western needlegrass	53	1

Environment

Elev: 5155 (4440-5680)
Aspect: All
Slope: 6 (0-35)

Landform: On lava pressure ridges, plateaus, benches, and lower colluvial slopes.

R5 Site Class: 4 (3-4)

Special: High cover of Bloomer goldenbush indicates soil surface disturbance.

Landscape Ecology and Environment

This plant association is distributed throughout the Eastside Pine area. The type occurs on the flatter parts of mountain sideslopes, on basalt lava pressure ridges, and on flat lava bench and plateau areas. Precipitation ranges from 14 to 35 inches annually. Available water holding capacity is moderate, and soils are usually loams and sandy loams.

Vegetation

Overstory vegetation is ponderosa pine, which is also the dominant regenerating species. White fir regeneration is occasionally found in areas with higher precipitation within the type. Older stands are open with a variable shrub understory dominated by bitterbrush.

Fire Ecology

Older stands in this plant association developed with frequent, low intensity ground fires. Fire return interval was probably 10 to 20 years on most sites. Shrub densities were lower with more frequent fire, and snag and log densities were patchy. Idaho fescue shades out with increased tree canopy from fire or thinning exclusion. Fall burns often kill bitterbrush. Spring burning with good soil moisture is less apt to damage bitterbrush and Idaho fescue.

Soils

Soils are variable. Soil depth in sites located on basalt plateaus tend to be deep. Sites found on lava benches and mountain sideslopes tend to be stonier and shallower. Available water holding capacity in the top 20 inches of soil ranges from less than 1 inch to over 4 inches. Soils are classified as Argixerolls, Xerorthents, Haploxerolls, and Haploxeralfs.

Productivity and Management

Young stands in this type have potential to overstock and stagnate unless mechanically thinned or underburned. Soil surface disturbance (e.g., from logging) can result in increased cover of Bloomer goldenbush (*Happlopappus bloomeri*), and cheatgrass (*Bromus tectorum*), especially in the drier sites. This plant association is important for cattle and sheep forage throughout the Eastside Pine area. Understories are usually open and herbage production is high.

PONDEROSA/BITTERBRUSH/NEEDLEGRASS//*PUMICE*
*PIPO/PUTR/STOC1//**PUMICE***

CPPSBB20

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa Pine, overstory	100	34
PIPOM	Ponderosa Pine, midstory	83	1
Tree Understory Layer			
PIPO	Ponderosa Pine	83	1
Shrubs			
PUTR	Bitterbrush	100	13
HABL	Bloomer goldenbush	100	1
RICE	Wax current	50	1
ARPA9	Greenleaf manzanita	50	1
Herbs			
PECI1	Ashy penstemon	83	1
ERNU3	Naked buckwheat	67	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	67	1

Environment

Elev: 5153 (4800-5640)
Aspect: All
Slope: 8 (0-26)

Landform: Mountain sideslopes and lower colluvial slopes and bottoms.

R5 Site Class: 4 (4-5)

Special: Pumice sites on lower slopes of the Medicine Lake Highlands.

Landscape Ecology and Environment

This plant association is found on sideslopes of cinder cones, knolls, benches and volcanic uplands in the Medicine Lake Highlands of the Modoc and Klamath National Forests. The upper 6 to 20 inches of soil is composed of pumice or ash from relatively recent volcanic ejecta. Slopes range from 0 to 30 percent. The type is found on all aspects at flatter, lower elevations, and tends to occur on southern exposures at higher, steeper elevations. Average annual precipitation ranges from 16 to 20 inches.

Vegetation

Dominant tree vegetation is ponderosa pine, which is also the primary regenerating species. Understory vegetation consists of dense bitterbrush, with lesser amounts of Bloomer goldenbush and wax current. Herbaceous vegetation is characterized by ashy penstemon and western needlegrass, in addition to the ubiquitous squirreltail, Ross' sedge, and annual herbaceous species. Greenleaf manzanita and possibly snowbrush can dominate these sites following high intensity burns. Wax current is a moderately shade-intolerant shrub that increases with logging disturbance and fire.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is more open and parklike, with fewer shrubs and probably more herbaceous vegetation.

Soils

Soils are moderately deep to deep and normally have a 6 to 20 inch pumice or ash overburden underlain by a loamy, loamy-skeletal, or medial family control section. Soils classify as Haploxeralfs, Xerochrepts, and Xerorthents, and are in the Holland, Holland-Lake, Skalan, Neer, or Yallani families. Available water holding capacity in the top 20 inches of soil is about 2 inches.

Productivity and Management

Regeneration potential for natural regeneration or planted tree seedlings is moderate because of the low to moderate available water holding capacity in the top 20 inches of soil. These soils are relatively low in nutrient supply. Practices that interfere with litter and organic matter accumulation and decomposition are not recommended.

SERIES AND TYPE DESCRIPTIONS

JEFFREY PINE
AND
PONDEROSA-JEFFREY SERIES

JEFFREY PINE AND PONDEROSA-JEFFREY (YELLOWPINE) SERIES

DISTRIBUTION AND ENVIRONMENT

The Jeffrey Pine series includes all forest stands currently dominated in the overstory and regeneration layers by Jeffrey pine.

Stands with stable mixes of Ponderosa and Jeffrey pine (the "Yellowpine" plant associations) are included in this series as they are more similar environmentally to Jeffrey Pine Series stands than they are to Ponderosa Pine Series stands.

The shade tolerance characteristics of ponderosa and Jeffrey pine are very similar. When the regeneration layer of the stand is dominated by this species, the overstory is almost always also composed of Jeffrey pine.

Within the study area, Jeffrey pine series is found in mixed ponderosa-Jeffrey and pure Jeffrey pine stands from the Big Valley Ranger District south through the Hat Creek and Eagle Lake Districts to the Eastside Plumas and Tahoe National Forests. The northeastern extent of the species is just north of the Pit River, on the Devil's Garden Ranger District. Native Jeffrey pine does not seem to grow very far north of the Pit River in the Eastside Pine region (Griffin & Critchfield 1972). Jeffrey pine has been planted in plantations north of the Pit River latitude, most notably the Sugar Hill and Hackamore plantations.

Jeffrey pine series stands grow on relatively cold, high elevation sites compared to ponderosa pine series stands (Haller 1959). Jeffrey pine series stands were compared with other series in this study by discriminant analysis, and the following differences were significant: compared to Ponderosa Pine Series stands, Jeffrey pine series stands grow at higher elevation sites with steeper slopes, lower available water holding capacity (shallower soils); and a lower "moisture index" (a transformation of AWC and precipitation). Jeffrey pine stands also tend to have lower levels of total vegetation canopy cover, lower total basal area, precipitation, soil depth, and wood fiber productivity than ponderosa pine series stands. Soil temperature regimes tend to be frigid in Jeffrey pine series stands, whereas ponderosa pine series stands tend to be mesic soil temperature regime.

SUBSERIES AND GROUPS

The most widespread subseries or group in the Jeffrey pine series and in Yellowpine stands is the Jeffrey/bitterbrush subseries. This combination of tree and dominant shrub occupies a large proportion of the study area. The highest cover of bitterbrush is usually found on flat aspects with relatively deep soils. Precipitation is variable. Bitterbrush is relatively shade-intolerant, and cover tends to decrease with increased tree cover.

Another important subseries in the Jeffrey pine subseries is the Jeffrey/mountain mahogany subseries. Mountain mahogany is found in varying amounts in many plant associations, but it reaches its highest expression in steep or rocky sites that are climatically or edaphically dry.

The Jeffrey/Sagebrush subseries or group is characterized by a dominant shrub layer of mountain big sagebrush. Mountain big sagebrush is also shade-intolerant, and cover of big sagebrush usually decreases dramatically at about sixty percent total tree cover.

Jeffrey-Black oak stands grow at relatively low elevations on sites with soil temperatures warm enough to allow black oak regeneration.

The Jeffrey/Serviceberry subseries is found in sites with higher tree cover. Basal area is higher, and soils are deeper and more productive. Site index is higher. Shrubs are usually at a lower cover overall in this subseries.

Jeffrey pine in association with mountain or spreading snowberry is found at relatively high elevation, moister sites than the other Jeffrey pine/yellowpine groups. These stands quite often have white fir regeneration.

FIRE ECOLOGY

Jeffrey pine associations and communities frequently border more open, shrub-dominated sites. Historical fire frequency in these drier types was probably 5-20 years prior to fire exclusion (Biswell 1972; Laudenslayer et al 1989; Hall 1977; Barrett 1988).

Frequent, cool underburns kept these communities open and parklike prior to fire exclusion practices that became effective some 80 years ago. Fuel accumulations were low, and the frequent fires performed the function of maintaining the open stands, cycling nutrients, reducing pathogens, and facilitating infrequent natural pine regeneration.

Fire exclusion allows succession of small pines which often grow to pole or sapling size and stagnate at that level. Some stands have thousands of stems per acre. These suppressed understories provide fuel ladders to the overstory, and facilitate the spread of pathogens such as dwarf mistletoe, root diseases, and bark beetles. Mortality and fuel loading is high, and fires often escalate into stand-replacing conflagrations that the original stands hardly ever experienced.

Some investigators hypothesize (Cochrane 1991) that fire exclusion in three-needle pine stands has enhanced wood fiber productivity because of the nutrients supplied to sites from decaying organic material which would formerly have burned up with frequent fires. This might prove to be a valid conclusion on soils with inherent low productivity such as those with a thick pumice or ash overburden.

See Appendix H for a generalized discussion of seral stages with different fire scenarios.

PRODUCTIVITY/MANAGEMENT

The generally harsher environmental surroundings of Jeffrey pine stands is reflected in lower tree productivity. Jeffrey pine series stands are not as productive for wood fiber as ponderosa pine stands. The most productive Jeffrey pine plant associations such as Jeffrey/Mahogany-Prunus have deeper, loamier soils than the less productive types such as Jeffrey-Black Oak/Skunkbrush. Some types, such as Jeffrey/Mahogany, are too rocky and unproductive for commercial timber production.

JEFFREY-BLACK OAK/SKUNKBRUSH
PIJE-QUKE/RHRTQ

CPJSBB11

Vegetation Summary Table
(Sample Size: 2)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	36
QUKEM	Black oak, midstory	100	21
JUOCM	Western juniper, midstory	100	3
PIJEM	Jeffrey pine, midstory	50	6
CADEM	Incensecedar, midstory	50	5
Tree Understory Layer			
QUKE	California black oak	100	2
JUOC	Western juniper	50	2
PIJE	Jeffrey pine	50	1
Shrubs			
RHRTQ	Skunkbrush	100	4
CELE3	Curlleaf mountain mahogany	100	4
AMPA2	Western serviceberry	100	2
PRVI	Chokecherry	100	2
PUTR	Bitterbrush	100	2
PRSU2	Sierra plum	50	1
RIMO	Alpine prickly current	50	1
SYAC	Spreading snowberry	50	1
BERE	Oregongrape	50	1
RHRUM	Modoc coffeeberry	50	1
Herbs			
BASA1	Arrowleaf balsamroot	100	2
ERLA6	Common woollysunflower	100	1
ASCO1	Purple milkweed	100	1
ERNU2	Naked buckwheat	100	1
ERINI	California rayless daisy	100	1
Grasses and Sedges			
POCA3	Canby bluegrass	100	1
SIHY	Squirreltail	100	1
CAMU1	Manystem sedge	50	2
BROR1	Orcutt brome	50	1

Environment

Elev: 5040 (5040-5040)
Aspect: Southwest; hot slopes
Slope: 28 (27-28)

Landform: Upper, middle 1/3 of mountain slopes.

R5 Site Class: 5 (4-5)

Special: Minor type found on hot, dry, exposed slopes. Skunkbrush indicates hot and dry soil conditions.

Landscape Ecology and Environment
Two samples were collected in this dry, hot plant association. Both are located in the extreme southwest of the Modoc National Forest. The type extends into adjacent Forest and BLM lands. Much of the type has been burned by wildfire in the last two decades.

Vegetation
The stand is dominated by Jeffrey pine, accompanied by black oak and incensecedar. The shrub layer is characterized by a variety of shrubs, including bitterbrush, mountain mahogany, serviceberry, and skunkbrush. Jeffrey pine will continue to dominate as the primary conifer, although in the absence of underburn fires western juniper is increasingly present.

Fire Ecology
Older stands in this type developed with frequent, low intensity underburns. Species favored with underburning include larger trees with fire-resistant bark, sprouting trees and shrubs such as black oak, skunkbrush, and western serviceberry, and many herbaceous species. Species that increase in the absence of fire in this type include western juniper, bitterbrush and prickly current.

Soils
Soils in the sample plots were in the Lawyer family, and are classified as loamy-skeletal, mixed, mesic, Pachic Ultic Argixerolls.

Productivity and Management
Productivity of the type for wood fiber is very low because of the hot, dry, south-facing aspects and stony soils. Oak mast is an important wildlife forage, and the diversity of shrub species provides significant wildlife habitat.

JEFFREY/SAGEBRUSH/FESCUE
PIJE/ARTRV/FEID

CPJSSB11

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	34
PIJEM	Jeffrey pine, midstory	83	9
PIPOT	Ponderosa pine, overstory	50	9
PIPOM	Ponderosa pine, midstory	33	10
JUOCM	Jeffrey pine, midstory	33	6
ABCOM	White fir, midstory	33	2
Tree Understory Layer			
PIJE	Jeffrey pine	100	2
ABCO	White fir	33	2
PIPO	Ponderosa pine	33	2
Shrubs			
ARTRV	Mountain big sagebrush	100	9
AMPA2	Western serviceberry	83	2
HABL	Bloomer goldenbush	83	1
ARPA9	Greenleaf manzanita	67	6
CEPR	Mahala mat	67	6
PUTR	Bitterbrush	33	2
Herbs			
MINU2	Perennial nodding microseris	83	1
SEINM	Tower butterweed	67	1
WYMO	Mountain mulears	67	1
ARHOR	Holboell's rock cress	50	1
CAAP	Applegate's paint brush	50	1
KEGA	Kellogia	50	1
MOODG	Mountain monardella	50	1
Grasses & Sedges			
FEID	Idaho fescue	100	13
SIHY	Squirreltail	100	3
CARO1	Ross' sedge	100	2
STOC1	Western needlegrass	83	2

Environment

Elev: 5845 (5380-6130)
Aspect: South slopes
Slope: 6 (1- 16)

Landform: Middle to upper 1/3 of mountain sideslopes.

R5 Site Class: 3 (3-4)

Special: High cover of Bloomer goldenbush indicates soil surface disturbance. Greenleaf manzanita potential following hot fires.

Landscape Ecology and Environment

This plant association is found on mountain sideslopes and hills on 0 to 25 percent slopes. Elevation ranges from 5300 to 6200 feet, and the average annual precipitation ranges from 16 to 25 inches. Aspects are mostly southerly. The type was sampled on the Eagle Lake and Hat Creek Districts, Lassen National Forest.

Vegetation

Vegetation is characterized by a dominant overstory of Jeffrey pine, with a shrub and herbaceous understory that includes mountain big sagebrush, greenleaf manzanita, serviceberry, mountain monardella, idaho fescue (high cover), and western needlegrass. This type has a low tree canopy cover which allows shade-intolerant shrubs such as greenleaf manzanita and mountain big sagebrush to attain relatively high cover values.

Fire Ecology

Older stands in this plant association developed with frequent, low intensity ground fires. Fire return interval was probably 10 to 20 years on most sites. Shrub densities were lower with more frequent fire, and snag and log densities were patchy. Idaho fescue shades out with increased tree canopy from fire or thinning exclusion. Fall burns often kill bitterbrush. Spring burning with good soil moisture is less apt to damage bitterbrush and Idaho fescue. Mountain big sagebrush is susceptible to any intensity of fire. Greenleaf manzanita and/or snowbrush can be expected to aggressively occupy these sites when they are logged or burned.

Soils

Soils are mostly moderately deep loamy-skeletal or fine-loamy Ultic Argixerolls or Ultic Haploxerolls over hard to soft andesite or basalt bedrock. Available water holding capacity at 20 inches ranges from 2 to 3 inches.

Productivity and Management

Young stands in this type have potential to overstock and stagnate unless mechanically thinned or underburned. Soil surface disturbance (e.g., from logging) can result in increased cover of Bloomer goldenbush (*Happlopappus bloomeri).* Idaho fescue is a preferred forage for domestic cattle.

JEFFREY/MAHOGANY
PIJE/CELE3

CPJSMC11

Vegetation Summary Table
(Sample Size: 3)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	24
PIJEM	Jeffrey pine, midstory	100	3
JUOCM	Juniper, midstory	66	7
Tree Understory Layer			
PIJE	Jeffrey pine	100	12
Shrubs			
CELE3	Mountain mahogany	100	12
PUTR	Bitterbrush	67	13
ARPA9	Greenleaf manzanita	67	1
ARTRV	Mountain big sagebrush	33	20
Herbs			
CLRH	Forest clarkia	67	1
VIPU	Mountain violet	67	1
WYMO	Mountain mulears	33	6
Grasses & Sedges			
SIHY	Squirreltail	100	3
CARO1	Ross' sedge	100	1
POSA3	Sandberg bluegrass	100	1
STOC1	Western needlegrass	67	1

Environment

Elev: >4000 ft.
Aspect: All
Slope: 1-20

Landform: Talus slopes; tops of rocky knobs.

R5 Site Class: 4 (3-5)

Special: Extremely high rock content and high mahogany cover. Type is scattered throughout the Eastside Pine region.

Landscape Ecology and Environment

This minor type occurs on the tops of rocky volcanic knobs or on basalt talus slopes of volcanic shields or domes. Elevations are variable, and the type occurs throughout the Eastside Pine area.

Vegetation

The dominant overstory vegetation is Jeffrey pine, with a clearly dominant understory of curlleaf mountain mahogany that usually exceeds ten percent canopy cover.

Fire Ecology

These stands are nearly fireproof because of their position on the landscape and because of the extreme stoniness, which tends to act as a natural firebreak. Many stands have large diameter mountain mahogany, which suggests a long fire interval. These stands did periodically burn during development, however, as large trees in the type often have fire scars.

Soils

Sampled soils included mesic and frigid Ultic Argixerolls and Ultic Haploxerolls, in the Hiibner, Jorge, and Shaver families. The type is widespread but localized, and many more soil types are probably represented.

Productivity and Management

These sites have inherent low productivity for wood fiber or grazing because of the extreme stoniness and low water holding capacity. These sites are valuable for wildlife foraging, bedding, shading, and roosting.

JEFFREY/BITTERBRUSH-MAHOGANY/NEEDLEGRASS
PIJE/PUTR-CELE3/STOC1

CPJSBB12

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	40
PIJEM	Jeffrey pine, midstory	83	11
PIPOT	Ponderosa pine, overstory	17	10
Tree Understory Layer			
PIJE	Jeffrey pine	83	1
Shrubs			
CEPR	Mahala mat	100	13
CELE3	Mountain mahogany	100	1
PUTR	Bitterbrush	83	4
ARTRV	Mountain big sagebrush	50	3
ARPA9	Greenleaf manzanita	33	2
Herbs			
LUCA2	Spurred lupine	33	1
MINU2	Perennial nodding microseris	100	1
SEINM	Tower butterweed	83	1
WYMO	Mountain mulears	83	1
CRAC2	Hawksbeard	67	1
MOODG	Mountain monardella	50	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
PONE1	Wheeler bluegrass	83	1
CARO1	Ross' sedge	83	1
STOC1	Western needlegrass	67	1
POSA3	Sandberg bluegrass	57	1

Environment

Elev: 5920 (5760-6100)
Aspect: All
Slope: 16 (3-25)
Landform: Middle and lower 1/3 slopes of mountains.
R5 Site Class: 4 (3-4)

Special: Big sagebrush is shade-intolerant.

Landscape Ecology and Environment

This plant association occurs on sideslopes of mountains and hills on nearly level to 25 percent slopes. Elevation ranges from 5780 to 6100 feet, and estimated annual precipitation ranges from 16 to 30 inches.

Vegetation

The type is open and dry, with a Jeffrey pine overstory and an understory composed of bitterbrush, mountain mahogany, sagebrush, mountain mulears, and western needlegrass.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer seedling, sapling, and pole-sized trees, fewer shrubs, and higher cover of herbaceous vegetation. Mountain big sagebrush is easily killed by fire. Greenleaf manzanita will sprout following hot fires, and also germinate from seed where a seed bank is present. Excluding ground fires or lack of thinning can lead to the development of "doghair thickets" of small, suppressed ponderosa pines with very little understory. These thickets are highly susceptible to high intensity wildfire and organisms such as dwarf mistletoe and mountain pine beetle.

Soils

Soils are moderately deep and are formed over hard to soft weathered andesite. The soils are classified as Typic and Ultic Xerumbrepts, Haploxerolls, and Argixerolls, and are in the Franktown, Klicker, and Trojan families. Available water holding capacity in the top 20 inches of soil ranges from 2 to 3 inches.

Productivity and Management

Mechanical site preparation is readily accomplished in this plant association because of the low rock content of the soils. Tree seedling survivability in the deeper, loamier soils in the type will be moderate to high. The type is used extensively for livestock forage. Bitterbrush and mountain mahogany are important browse species for wildlife.

JEFFREY/BITTERBRUSH-SNOWBERRY/BLUEGRASS
PIJE/PUTR-SYVA/POA

CPJSBB13

Vegetation Summary Table
(Sample Size: 13)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	53
PIJEM	Jeffrey pine, midstory	92	4
ABCOM	White fir, midstory	23	2
JUACM	Sierra juniper, midstory	15	2
Tree Understory Layer			
PIJE	Jeffrey pine	100	1
Shrubs			
SYVA	Mountain snowberry	92	3
PUTR	Bitterbrush	92	3
CEPR	Mahala mat	85	4
ARTRV	Mountain big sagebrush	69	4
HABL	Bloomer goldenbush	62	1
AMPA2	Western serviceberry	54	1
ARPA9	Greenleaf manzanita	46	2
ROWOU	Interior rose	31	2
Herbs			
WYMO	Mountain mulears	85	3
LUCA2	Spurred lupine	69	1
MOODG	Mountain monardella	69	1
MINU2	Perennial nodding microseris	54	1
BASA1	Arrowleaf balsamroot	46	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	92	1
STOC1	Western needlegrass	69	1
PONE1	Wheeler bluegrass	62	1
BROR1	Orcutt brome	54	1

Environment

Elev: 6297 (5600-7000)
Aspect: All
Slope: 24 (11-43)
Landform: Middle and upper 1/3 slopes of mountains
R5 Site Class: 4 (3-5)

Special: Snowberry; orcutt brome are moist site indicators. Interior rose indicates int. or per. riparian area nearby.

Landscape Ecology and Environment

This plant association occurs on moderate to steep slopes on the south aspects of mountains and hills. Elevation ranges from 5600 to 7000 feet. Estimated average annual precipitation ranges from 16 to 30 inches.

Vegetation

Jeffrey pine is dominant in these stands. Some stands with healthy white fir reproduction will eventually (150 yrs) convert to a Jeffrey-white fir mix. At present Jeffrey pine reproduction equals or exceed white fir reproduction in these stands. Mountain snowberry is the characteristic shrub in the type. The type in general is cool and moist (for Eastside Pine), as indicated by the presence of vegetation such as mountain snowberry and snowbrush. Presence of interior rose indicates near proximity of a perennial or intermittent riparian area.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is open and parklike, with fewer seedling, sapling, and pole-sized trees, fewer shrubs, and higher cover of herbaceous vegetation. Mountain snowberry, western serviceberry, greenleaf manzanita, and snowbrush will crown sprout following fires, and also germinate from seed where a seed bank is present. Excluding ground fires or lack of thinning can lead to the development of "doghair thickets" of small, suppressed Jeffrey pine and/or white fir with very little understory. These thickets are highly susceptible to high intensity wildfire and organisms such as dwarf mistletoe and mountain pine beetle.

Soils

Soils are moderately deep to deep, and are derived from andesite and basalt bedrock geology. The soils are classified as Mollic, Entic, and Ultic Haploxerolls, Ultic Argixerolls, Dystric Xerochrepts, and Lithic Xerorthents. Temperature regime for most of the plots is frigid. The two soil taxa most represented in the type are the Klicker and Trojan families.

Productivity and Management

Mechanical site preparation will be difficult in the stonier and steeper extremes of the type. Tree survivability in the deeper, loamier soils in the type will be moderate to high. Snowberry, bitterbrush, and serviceberry are important browse species for wildlife.

JEFFREY/BITTERBRUSH/MULEARS
PIJE/PUTR/WYMO

CPJSBB14

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	33
PIJEM	Jeffrey pine, midstory	100	8
PIPOT	Ponderosa pine, overstory	50	11
PIPOM	Ponderosa pine, midstory	33	13
Tree Understory Layer			
PIJE	Jeffrey pine	83	1
Shrubs			
CEPR	Mahala mat	100	5
PUTR	Bitterbrush	100	2
ARPA9	Greenleaf manzanita	50	3
Herbs			
WYMO	Mountain mulears	100	9
HECAN	Sierra helianthella	83	1
LUCA2	Spurred lupine	67	1
MINU2	Perennial nodding microseris	67	1
ARHOR	Holboell's rock cress	50	1
SEINM	Tower butterweed	50	1
CALE6	Smokey mariposa	50	1
BASA1	Arrowleaf balsamroot	50	1
Grasses & Sedges			
STOC1	Western needlegrass	100	1
SIHY	Squirreltail	83	1
BROR1	Orcutt brome	50	1
PONE1	Wheeler bluegrass	50	1
CARO1	Ross' sedge	33	2

Environment

Elev: 5907 (5640-6750)
Aspect: All
Slope: 5 (2-7)
Landform: Flats and bottoms; lower colluvial slopes
R5 Site Class: 3 (2-5)

Special: Sites are possibly subirrigated. Deep alluvial soils.

Landscape Ecology and Environment

This type was sampled on the Milford Ranger District, Plumas National Forest. The sample plots were located in deep alluvium deposited in ancient floodplains and river valleys.

Vegetation

The dominant overstory tree species is Jeffrey pine, with a less constant component of ponderosa pine. Tree regeneration is mostly Jeffrey pine. Bitterbrush is the most prominent understory shrub, and the herbaceous layer is dominated by high cover of mountain mulears. Western needlegrass is the most common grass to all the plots.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Fire return interval was probably 10 to 20 years on average prior to extensive grazing and fire exclusion that started about 100 years ago. Appearance of older stands with a presettlement fire frequency was open and parklike, with fewer shrubs and more herbaceous vegetation than at present. A combination of fire and sheep grazing and trailing probably contributed to the high cover values of mountain mulears found in the type at present.

Soils

The soils are moderately deep to deep, and are formed over hard to soft weathered andesite. Available water holding capacity ranges from 2 to 3 inches in the top 20 inches of soil. The soils classify as Lithic and Ultic Haploxeralfs, and as Ultic Argixerolls. Temperature regime is frigid.

Productivity and Management

Mechanical site preparation is readily accomplished in this plant association because of the low rock content of the soils. Tree survivability in the deeper, loamier soils in the type will be moderate to high. Greenleaf manzanita is a potential increaser in the event of hot or stand replacing fires. Mulears is an increaser with surface disturbance, and also exhibits allelopathic characteristics that inhibit tree seedling and understory vegetation establishment and survival (Yoder-Williams 1987).

YELLOWPINE-DOUGLASFIR/BITTERBRUSH/MULEARS
YP-PSME/PUTR/WYMO **CPJSBB15**

Vegetation Summary Table
(Sample Size: 4)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	31
PIJET	Jeffrey pine, overstory	100	15
CADEM	Incensecedar, midstory	100	7
PIPOM	Ponderosa pine, midstory	100	6
CADET	Incensecedar, overstory	50	14
PSMEM	Douglasfir, midstory	50	4
QUKEM	Black oak, midstory	50	3
PSMET	Douglasfir, overstory	25	8
Tree Understory Layer			
CADE3	Incensecedar	100	2
PIPO	Ponderosa pine	75	1
QUKE	California black oak	75	1
PSME	Douglasfir	50	1
PIJE	Jeffrey pine	25	1
Shrubs			
CEPR	Mahala mat	100	13
PUTR	Bitterbrush	100	5
AMPA2	Western serviceberry	100	1
ARPA9	Greenleaf manzanita	75	1
RIMO	Alpine prickly current	50	1
CECO2	Mountain whitethorn	25	1
SYAC	Spreading snowberry	25	1
Herbs & Graminoids			
WYMO	Mountain mulears	100	9
LANE	Sierra nevada pea	100	1
CLRH	Forest clarkia	100	1
HECAN	Sierra helianthella	50	1
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	50	1
BROR1	Orcutt brome	50	1

Environment

Elev: 5570 (5480-5700)
Aspect: Northfacing
Slope: 27 (8-43)
Landform: Mountaintops; upper 1/3 slopes
R5 Site Class: 3 (3-3)

Special: Transitions to dry mixed conifer type; indicators = ABCO; PSME; CECO2.

Landscape Ecology and Environment

This type was sampled near Sierra Valley, California. The type occurs on north facing slopes and quickly transitions with increasing elevation to a dry mixed conifer type with dominant douglasfir, white fir, and incensecedar.

Vegetation

The overstory vegetation is dominated by ponderosa pine and Jeffrey pine, with lesser amounts of overstory and midstory incensecedar and douglasfir. Black oak is often in the understory. Regenerating species include the shade tolerant incensecedar, douglasfir, and white fir. With continued fire exclusion, these stands will eventually be dominated by the more shade tolerant trees. Shrub vegetation is diverse and includes bitterbrush, serviceberry, greenleaf manzanita, and mountain whitethorn. The latter species is a transition species that is common on the westside of the Sierra Nevada and uncommon in the Eastside Pine area. The herbaceous understory is characterized by mulears, sierra nevada pea, and forest clarkia.

Fire Ecology

These stands developed with periodic underburning. Large pine trees consistently show fire scars from multiple burns in the past. Fire return interval was probably 20 to 30 years on average prior to fire exclusion that started about 100 years ago. Stands in this type are somewhat more mesic than lower elevation pure pine stands, so fires may have burned more erratically and produced more of a mosaic effect of species occurrence and size and age distribution. Douglasfir and white fir have probably always been minor stand components. Shrub species favored by fire include greenleaf manzanita, western serviceberry, mountain whitethorn, and spreading serviceberry. Bitterbrush decreases density with fire.

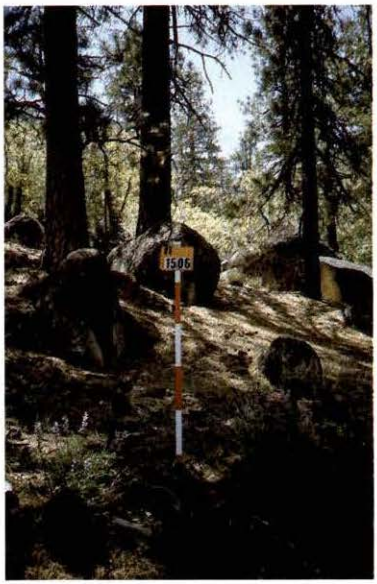
Soils

The soils are fine, loamy, mixed, frigid Ultic Haploxeralfs and Argixerolls, in the Trojan, Klicker, and Delleker soil families. Available water holding capacity in the upper 20 inches of soil is relatively high at 2 to 3 inches. Rock content of these sites is low.

Productivity and Management

Productivity of this type for wood fiber is in the lower 1/3 when compared to other Eastside Pine types. Mulears may increase cover with mechanical site disturbance or burning.

YELLOWPINE-BLACK OAK/BLUEGRASS//*GRANITE*
YP-QUKE/POA//GRANITE



Vegetation Summary Table
(Sample Size: 2)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	45
PIPOT	Ponderosa pine, overstory	100	8
QUKEM	Black oak, midstory	100	4
Tree Understory Layer			
QUKE	California black oak	100	1
PIJE	Jeffrey pine	100	1
Shrubs			
PUTR	Bitterbrush	100	3
CEPR	Mahala mat	50	1
Herbs			
LUCA2	Spurred lupine	100	2
ANLU2	Silvery-brown pussytoes	100	1
ARCO5	Ballheaded sandwort	100	1
MACA1	Hoaryaster	100	1
HIHO	Shaggy hawkweed	100	1
MEDI	Nada stickleaf	100	1
ERLA6	Common woollysunflower	100	1
ERINI	California rayless daisy	50	1
ERNU2	Naked buckwheat	50	1
MINU2	Perennial nodding microseris	50	1
Grasses & Sedges			
POSA3	Sandberg bluegrass	100	2
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	50	1
FEID	Idaho fescue	50	1

Environment

Elev: 5325 (5200-5450)
Aspect: North
Slope: 26 (22-30)
Landform: Lower 1/3 mountain slopes; toeslopes
R5 Site Class: 4 (4-4)

Special: Granitic soils highly erodible. Black oak crown sprouts when burned.

Landscape Ecology and Environment

This minor type was sampled on the lower Diamond Mountain escarpment, Milford Ranger District, Plumas National Forest. Much of this localized type was burned over in the Clarks and Eagle wildfires of 1987 and 1988.

Vegetation

The association is an open Jeffery and ponderosa pine stand, mixed with black oak. The type occurs on decomposed granite. Aspects are northerly, slopes are relatively steep, and elevation for the type ranges from about 5000 to 5500 feet.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 10 to 20 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Black oak crown sprouts after wildfire. Cheatgrass can be expected to increase following wildfire, and possibly greenleaf manzanita. Bitterbrush recovers slowly if at all from high intensity wildfire.

Soils

The soils are classified as sandy, mixed, frigid, Entic Haploxerolls, and as mixed, frigid, shallow Typic Xerpsamments. These soil taxa are in the Haypress and Toiyabe families.

Productivity and Management

In this decomposed granite type, erosion potential is high and inherent productivity is low. Activities that degrade water and nutrient cycling in these soils are counterproductive. Total site disturbance from wildfire or site preparation can be devastating in terms of stand stability and succession. These sites are hot and dry, in spite of the northerly aspects. Plant indicators of these relatively harsh conditions are Jeffrey pine, black oak, naked buckwheat, nada stickleaf, pussytoes, ballheaded sandwort, and columbia pucoon. Spurred lupine increases with overgrazing or mechanical disturbance. Black oak in this location is disjunct from other populations (Griffin & Critchfield 1972; Young et al 1977). This plant association is critical deer winter range, and provides important foraging, roosting, and nesting habitat for numerous wildlife species.

YELLOWPINE-BLACK OAK/SERVICEBERRY
YP-QUKE/AMPA2 **CPJSAM11**

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	46
CADEM	Incensecedar, midstory	60	4
CADET	Incensecedar, overstory	40	15
PIJET	Jeffrey pine, overstory	40	6
QUKEM	Black oak, midstory	40	5
PIPOM	Ponderosa pine, midstory	40	2
PIJEM	Jeffrey pine, midstory	40	1
ABCOM	White fir, midstory	20	5
Tree Understory Layer			
CADE3	Incensecedar	100	8
QUKE	California black oak	100	1
PIPO	Ponderosa pine	100	1
JUOC	Western juniper	80	1
PIJE	Jeffrey pine	80	1
Shrubs			
CEPR	Mahala mat	100	8
ARPA9	Greenleaf manzanita	80	2
CELE3	Mountain mahogany	80	1
AMPA2	Western serviceberry	80	1
PUTR	Bitterbrush	40	3
Herbs & Graminoids			
LUCA2	Spurred lupine	100	3
WYMO	Mountain mulears	100	1
LANE	Sierra nevada pea	80	1
ERINI	California rayless daisy	80	1
HIHO	Shaggy hawkweed	80	1
BASA1	Arrowleaf balsamroot	60	1
SIHY	Squirreltail	100	1
POCA3	Sandberg bluegrass	80	1
CAMU1	Manystem sedge	60	1

Environment

Elev: 4840 (4680-5040)
Aspect: Northwest, west
Slope: 33 (5-48)
Landform: Middle slopes on mountains.
R5 Site Class: 3 (3-4)

Special: Black oak in association with incensecedar.

Landscape Ecology and Environment

This plant association occurs on the northwest and west facing sidelopes of mountains, hills, and ravines. The type is extensive, and was sampled on the Big Valley and Hat Creek Districts. Elevation ranges from 4560 to 5040 feet, and average annual precipitation ranges from 16 to 20 inches.

Vegetation

The association is an open ponderosa and Jeffery pine stand, mixed with black oak. The understory shrub composition depends on overstory canopy cover. Open pine stands have more shade-intolerant shrubs such as bitterbrush and greenleaf manzanita, and closed stands with high basal area have less bitterbrush and more serviceberry, which is a shade-tolerant shrub. Mountain mahogany is an indicator of stony sites. Incensecedar occurs in pine stands that are slightly moister than pure ponderosa or Jeffrey pine stands, but not moist enough for mixed conifer species such as white fir. Incensecedar can tolerate hotter and dryer conditions than white fir, and is commonly found on upper or middle slopes that typically have shallower soils and lower water holding capacities. Black oak is almost always found in close proximity to incensecedar. Incensecedar is one of the few trees in our area that supports vesicular-arbuscular mycorrhizae (western juniper is another); all other coniferous trees in our area form symbiotic relationships with ectomycorrhizae. Coniferous trees usually exhibit lower survival and growth rates unless inoculated with ectomycorrhizae, with the exception of incensecedar and western juniper.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 10 to 20 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Black oak crown sprouts when burned, as does western serviceberry and greenleaf manzanita. Greenleaf manzanita has potential to dominate this type following a high intensity fire.

Soils

Soils are classified as fine-loamy and loamy-skeletal mixed, mesic, Pachic Ultic Argixerolls. Soils are in the Lawyer and Elmore families. Available water holding capacity ranges from 2 to 3 inches in the top 20 inches of soil.

Productivity and Management

The timber productivity of this type splits distinctly on soil depth. Soils less than 36" deep (moderately deep) are less productive than deep soils that are greater than 41" deep. These soils have higher available water holding capacities and moderate to high seedling survival potentials except where limited by stoniness. Black oak is a valuable species for wildlife.

YELLOWPINE/SAGEBRUSH-BITTERBRUSH
YP/ARTRV-PUTR

CPJSBB17

Vegetation Summary Table
(Sample Size: 9)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	47
PIPOM	Ponderosa pine, midstory	89	6
PIJET	Jeffrey pine, overstory	56	16
PIJEM	Jeffrey pine, midstory	44	2
Tree Understory Layer			
PIPO	Ponderosa pine	89	1
PIJE	Jeffrey pine	89	1
Shrubs			
PUTR	Bitterbrush	100	6
CEPR	Mahala mat	67	3
ARTRV	Mountain big sagebrush	56	2
ARPA9	Greenleaf manzanita	22	2
Herbs			
WYMO	Mountain mulears	89	2
LUCA2	Spurred lupine	56	1
SEINM	Tower butterweed	44	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	100	1
POCA3	Canby bluegrass	67	1
STOC1	Western needlegrass	67	1

Environment

Elev: 5911 (5680-6520)
Aspect: All
Slope: 21 (3-47)
Landform: Various.
R5 Site Class: 3 (2-4-4)

Special: Dry site second growth stands on glacial outwash.

Landscape Ecology and Environment

This plant association occurs on mountain sideslopes and gently rolling hills that are the remnants of glacial moraines. Elevations range from 5680 to 6520 feet, and slopes are mostly flat. The type was sampled on the Truckee and Sierraville Districts, Tahoe National Forest. The type was extensively railroad logged from early in this century, and most of the stands are second growth..

Vegetation

The general appearance of the type is an open, dry, mixed ponderosa and Jeffrey pine stand with a moderately dense shrub understory dominated by bitterbrush and mountain big sagebrush. Mountain mulears and canby bluegrass characterize the herbaceous vegetation.

Fire Ecology

Older stands in the type developed with low intensity ground fires, which have been suppressed now for some 80 years. Fire suppression has allowed the increased densities of taprooted shrubs such as bitterbrush and sagebrush. The pine canopy now has a multilayered character, which has led to ideal conditions for dwarf mistletoe infestations in the lower canopy layers.

Soils

Soils range from moderately deep to deep in this type. Soil taxa include frigid Lithic and Lithic Ultic Haploxeralfs, in the Jorge and Kyburz families. Deep soils in the type are more productive than moderately deep soils. The type has been mostly logged over and soil compaction was encountered in the type plots. Residual substratum compaction from glaciation may also be encountered in this type.

Productivity and Management

Tree regeneration potential is generally good due to favorable slopes and moderately deep to deep soils. The type was historically extensively logged with overstory removal and is now occupied by second growth trees. Dwarf mistletoe is common because of stand history and structure. Soil ripping to break up subsurface compaction may be beneficial in some sites.

YELLOWPINE/MAHOGANY/WHEATGRASS
YP/CELE3/AGSP

CPJSMC12

Vegetation Summary

Table
(Sample Size: 3)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	37
PIJET	Jeffrey pine, overstory	33	10
PIJEM	Jeffrey pine, midstory	33	1
Tree Understory Layer			
PIPO	Ponderosa pine	67	1
JUOC	Western juniper	67	1
ABCO	White fir	33	1
CADE3	Incensecedar	33	1
Shrubs			
CELE3	Mountain mahogany	100	15
HABL	Bloomer goldenbush	100	1
RICE	Wax current	100	1
PUTR	Bitterbrush	67	2
LEPU	Granite gilia	67	1
ARTRV	Mountain big sagebrush	67	1
CEVE3	Snowbrush	33	1
PRVI	Chokecherry	33	1
RIVI	Plateau gooseberry	33	1
PREM	Bitter cherry	33	1
ROWOU	Interior rose	33	1
Herbs & Graminoids			
ARDI5	Spreading rock cress	33	1
PEDEH	Hot rock penstemon	33	1
AGRE2	Spearleaf mtn. dandelion	33	1
CRAC2	Hawksbeard	33	1
ERFI2	Thread-leaved daisy	33	1
AGSP	Bluebunch wheatgrass	100	2
SIHY	Squirreltail	100	1
POCA3	Sandberg bluegrass	100	1
FEID	Idaho fescue	67	5
STOC1	Western needlgrass	67	1

Environment

Elev: 5203 (5140-5240)
Aspect: All
Slope: 1 (1-2)
Landform: On and adjacent to rocky, undulating lava flows.
R5 Site Class: 4 (3-4)

Special: Bluebunch wheatgrass is a dry environment indicator.

Landscape Ecology and Environment

This plant association was sampled on and near the Brockman lava flow, Lassen National Forest. The type is often found in high rock cover environments such as lava flows in reef-like formations on nearly level to gently sloping basalt plateaus.

Vegetation

Typical vegetation is an overstory of ponderosa pine, Jeffrey pine, and western juniper, with a shrub understory of mountain mahogany, wax current, bitterbrush, and occasionally snowbrush.

Fire Ecology

Fires have been somewhat limited in this type because of the inherent fireproofing afforded by the extreme rockiness, which acts as an effective firebreak. As a result, slow-growing plants such as mahogany have attained large stem diameter and size. Stand replacement fire could occur in this type under extreme fire weather conditions. Greenleaf manzanita and snowbrush would probably occupy the site for a time following a hot burn.

Soils

Soils are classified as loamy-skeletal, mixed, frigid, Lithic Ultic Haploxeralfs and Haploxerolls, in the Anatone, Duckhill, and Gaib families.

Productivity and Management

Tree plantability will be extremely difficult in all but the "flowerpot" and other less rocky areas due to the extreme stoniness. Regeneration potential is very low in the lava flow and shallow soils, and normally low to moderate in the flowerpot depressions. This plant association is very important for wildlife habitat especially when it is found adjacent to bodies of water such as Eagle Lake. Ospreys and eagles roost and nest in the type, and the type is habitat for deer, rodents, neotropical songbird migrants, etc. This association is usually too rocky for domestic livestock grazing.

YELLOWPINE/MAHOGANY/BALSAMROOT
YP/CELE3/BASA1

CPJSMC13

Vegetation Summary Table
(Sample Size: 19)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	29
PIJET	Jeffrey pine, overstory	95	26
PIJEM	Jeffrey pine, midstory	68	5
PIPOM	Ponderosa pine, midstory	63	6
JUOCM	Western juniper, midstory	53	3
Tree Understory Layer			
JUOC	Western juniper	79	1
PIJE	Jeffrey pine	63	1
PIPO	Ponderosa pine	53	1
Shrubs			
CELE3	Mountain mahogany	95	4
PUTR	Bitterbrush	89	1
AMPA2	Western serviceberry	89	1
CEPR	Mahala mat	63	4
PRVI	Chokecherry	26	2
RIVI	Plateau gooseberry	21	1
Herbs			
HIHO	Shaggy hawkweed	84	1
LUCA2	Spurred lupine	79	2
BASA1	Arrowleaf balsamroot	74	2
WYMO	Mountain mulears	74	2
LANE	Sierra nevada pea	42	1
Grasses & Sedges			
SIHY	Squirreltail	89	1
CARO1	Ross' sedge	74	1
PONE1	Wheeler bluegrass	58	2
FEID	Idaho fescue	47	1
POSA3	Sandberg bluegrass	42	1
POCA3	Canby bluegrass	37	1

Environment

Elev: 5408 (4600-6150)
Aspect: Northerly
Slope: 28 (3-60)
Landform: Ridgetops; upper and middle mountain slopes.
R5 Site Class: 3 (2-5)

Special: Spurred lupine is an increaser with grazing/logging disturbance.

Landscape Ecology and Environment

This plant association occurs on mountain sideslopes and ravines. This type is similar to the Yellowpine-Blackoak/Serviceberry type, but has no black oak. The type was sampled on the Big Valley and Hat Creek Districts. Elevation ranges from 4600 to 6150 feet, and average annual precipitation ranges from 16 to 27 inches.

Vegetation

Overstory vegetation is a mix of Jeffrey pine, ponderosa pine, and midstory western juniper. Understory vegetation consists of bitterbrush, mountain mahogany, and pallid serviceberry. Herbaceous vegetation usually includes the large composite forbs arrowleaf balsamroot and/or mountain mulears.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 10 to 20 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Repeated understory burns thinned trees from below and reduced shrub densities. Greenleaf manzanita is present in a small number of plots sampled in this type (16 percent constancy), and can be expected to germinate from dormant seed given appropriate conditions, i.e., a high intensity fire. Serviceberry will crown sprout when burned.

Soils

Soils are classified as mesic and frigid Ultic Argixerolls and Haploxerolls, in the Demasters, Elmore, Fordice, Hiibner, Jacket, Klicker, Lamondi, Lawyer, Rockford and Smarts families. Soils textures are loamy or loamy-skeletal with few rocks. Available water holding capacity at 20 inch soil depth averages 3 inches. Sites on the upper 1/3 slopes tend to be steeper and rockier than sites lower on mountain slopes.

Productivity and Management

Site preparation for tree planting is accomplished with relative ease on those sites with deeper soils. Steeper slopes are increasingly stony throughout the soil profile and are more difficult to manipulate with machinery. Spurred lupine is an increaser with grazing or logging disturbance.

YELLOWPINE/BITTERBRUSH/FESCUE
YP/PUTR/FEID

CPJSBB18

Vegetation Summary Table
(Sample Size: 3)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	33
PIJET	Jeffrey pine, overstory	100	19
PIPOM	Ponderosa pine, midstory	100	6
PIJEM	Jeffrey pine, midstory	67	3
Tree Understory Layer			
PIPO	Ponderosa pine	100	1
PIJE	Jeffrey pine	100	1
Shrubs			
PUTR	Bitterbrush	100	5
CEPR	Mahala mat	100	3
HABL	Bloomer goldenbush	67	2
ARPA9	Greenleaf manzanita	67	1
CELE3	Curlleaf mtn. mahogany	33	2
Herbs			
WYMO	Mountain mulears	67	4
ERUMU	Sulpher buckwheat	67	1
MINU1	Nodding microseris	67	1
LUCA2	Spurred lupine	33	2
Grasses & Sedges			
FEID	Idaho fescue	100	3
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	67	1
CARO1	Ross' sedge	67	1
TRCEC	Tall trisetum	33	2

Environment

Elev: 5348 (4400-5870)
Aspect: Mostly south-facing
Slope: 6 (1-12)
Landform: Lower 1/3; toe slopes.
R5 Site Class: 3 (3-3)

Special: Higher elevation version of Ponderosa/Bitterbrush/Fescue.

Landscape Ecology and Environment

This plant association is closely related to the Ponderosa/Bitterbrush/Fescue type, except that the overstory trees and regeneration are a mix of ponderosa and Jeffrey pine. The type was sampled on the Eagle Lake District, Lassen National Forest. Elevation of the sample plots ranges from 4400 to 5870 feet, and average annual precipitation ranges from 20 to 25 inches.

Vegetation

Overstory vegetation and regeneration are a mix of Jeffrey pine and ponderosa pine. Understory vegetation is dominated by bitterbrush, mountain mulears, and idaho fescue.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 10 to 20 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Repeated understory burns thinned trees from below and reduced shrub densities.

Soils

Soils are classified as loamy-skeletal and fine-loamy, mixed frigid and mesic Ultic Haploxerolls and Argixerolls, in the Klicker, Trojan, and Witzel families.

Productivity and Management

Young stands in this type have potential to overstock and stagnate unless mechanically thinned or underburned. Soil surface disturbance (e.g., from logging) can result in increased cover of bloomer goldenbush (*Happlopappus bloomeri)*, and cheatgrass (*Bromus tectorum)*, especially in the drier sites. This plant association is important for cattle and sheep forage throughout the Eastside Pine area. Understories are usually open and herbage production is high.

YELLOWPINE/BITTERBRUSH/FESCUE//*GRANITE*
YP/PUTR/FEID//GRANITE

CPJSBB19

Vegetation Summary Table
(Sample Size: 6)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	83	35
PIJEM	Jeffrey pine, midstory	83	3
PIPOT	Ponderosa pine, overstory	50	27
PIPOM	Ponderosa pine, midstory	50	1
Tree Understory Layer			
PIJE	Jeffrey pine	100	1
QUKE	California black oak	17	1
Shrubs			
PUTR	Bitterbrush	100	3
CEPR	Mahala mat	83	3
ARPA9	Greenleaf manzanita	67	1
HABL	Bloomer goldenbush	50	2
CELE3	Curlleaf mtn. mahogany	33	2
Herbs			
WYMO	Mountain mulears	83	1
LUCA2	Spurred lupine	67	1
MINU1	Nodding microseris	50	1
Grasses & Sedges			
FEID	Idaho fescue	100	3
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	100	1
CARO1	Ross' sedge	83	1
POSA3	Sandberg bluegrass	83	1
PONE1	Wheeler bluegrass	67	1
POCA3	Canby bluegrass	33	2

Environment

Elev: 5982 (5620-6210)
Aspect: Mostly south-facing
Slope: 14 (0-21)
Landform: Mountaintops; upper and middle 1/3 slopes
R5 Site Class: 4 (3-4)

Special: Decomposed granite is highly erodible.

Landscape Ecology and Environment

This plant association occurs on sideslopes and in convex areas of mountains and hills on nearly level to 20 percent slopes. Elevations range from 5600 to 6300 feet. The type mostly occurs on warmer and drier south and southwest upper slope positions, although the type can also be found on the southern Diamond Mountain escarpment, which is a north aspect. The type was sampled on the Milford District, Plumas National Forest.

Vegetation

This plant association when relatively undisturbed is a classic open pine community with an open shrub and grass understory. Overstory vegetation and regeneration are a mix of Jeffrey pine and ponderosa pine. Understory vegetation consists of bitterbrush, mountain mulears, and idaho fescue.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 10 to 20 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Repeated understory burns thinned trees from below and reduced shrub densities. Bitterbrush will decrease or disappear with high intensity fire, particularly hot fall fires with low soil moisture. Cheatgrass will increase cover significantly with ground disturbance or fire disturbance.

Soils

Soils are classified as frigid Typic, Entic, and Dystric Haploxeralfs, Xerumbrepts, Haploxerolls, and Xerpsamments, in the Bonta, Bucking, Haypress, Toiyabe and Wapi families. Soils are derived from granitic bedrock. They are inherently low in fertility and are sensitive to activities (e.g., burning) that remove or disturb the litter layer and organic materials of the forest floor. Erosion potential is high on slopes greater than 20%. Compaction is usually not a concern.

Productivity and Management

Greenleaf manzanita has potential to occupy these sites following a hot burn. Mulears (*Wyethia mollis*) is a strong presence in this type and will increase cover and site occupation with wildfire and other kinds of site disturbance such as overgrazing. There is evidence that *Wyethia mollis* foliage is allelopathic to planted pines and other kinds of vegetation, resulting in reductions in tree survival, natural regeneration, and root growth. Allelopathic effects are in addition to the water stress to planted pines in *Wyethia* communities, which is also significant (Yoder-Williams 1987) This plant association is important for cattle and sheep forage.

YELLOWPINE/BITTERBRUSH/BUTTERWEED//*GRANITE*
YP/PUTR/SEINM//GRANITE **CPJSBB20**

Vegetation Summary Table
(Sample Size: 4)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	39
PIPOM	Ponderosa pine, midstory	100	2
PIJET	Jeffrey pine, overstory	75	17
CADEM	Incensecedar, midstory	75	2
ABCOM	White fir, midstory	50	2
PSMEM	Douglasfir, midstory	50	4
Tree Understory Layer			
PIPO	Ponderosa pine	75	1
CADE3	Incensecedar	50	2
ABCO	White fir	50	1
Shrubs			
CEPR	Mahala mat	100	7
PUTR	Bitterbrush	100	4
ARPA9	Greenleaf manzanita	100	2
SYAC	Spreading snowberry	50	1
Herbs & Graminoids			
SEINM	Tower butterweed	100	1
CAAP	Applegate's paintbrush	75	1
LUCA2	Silvery-brown pussytoes	75	1
WYMO	Mtn. mulears	75	1
AGRE2	Spearleaf mtn. dandelion	50	1
CALE6	Smokey mariposa	50	1
ARCO5	Ballheaded sandwort	50	1
BASA1	Arrowleaf balsamroot	50	1
LUCA2	Spurred lupine	50	1
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	100	1
STOC1	Western needlegrass	75	1
POCA3	Canby bluegrass	75	1
FEID	Idaho fescue	50	1

Environment

Elev: 5665 (5530-5880)
Aspect: South-facing
Slope: 16 (3-33)
Landform: Ridgetops to lower 1/3 slopes.
R5 Site Class: 3 (3-4)

Special: Granitic soils highly erodible.

Landscape Ecology and Environment

This plant association is found on mountain sideslopes and flatter aspects on granitic soils. The type was sampled on the Milford District, Plumas National Forest. Slopes range from 3 to 33 percent, and elevation ranges from 5500 to 5900 feet.

Vegetation

Ponderosa and Jeffrey pine are dominant trees in the current stand. Regeneration in the absence of fire is beginning to include shade-tolerant conifers such as white fir, incensecedar and douglas fir. This plant association may have the potential with continued fire exclusion to convert to a white fir and douglas-fir dominated community in 100-150 years.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 30 to 40 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Douglas fir and white fir are components of biological potential, and have some presence in these stands regardless of fire regime. Greenleaf manzanita and possibly snowbrush can potentially occupy these sites following a hot burn, as dormant seed is likely to be present in the soil.

Soils

The soils are classified as frigid Entic and shallow Typic Xerumbrepts and Xerpsamments. These soil taxa are in the Bucking and Toiyabe families.

Productivity and Management

In this decomposed granite type, erosion potential is high and inherent productivity can be low. Activities that degrade water and nutrient cycling in these soils are counterproductive. Total site disturbance from wildfire or site preparation can be devastating in terms of stand stability and succession. Non-rocky sites are physically suited for tree planting, but tree survivability may be variable due to low available water holding capacity and low inherent soil productivity. Burning slash and forest floor materials with hot fires can further reduce soil productivity because of loss of nutrients. Organic matter inputs are somewhat less limiting in this type because of higher vegetation canopy levels that contribute more litter and organic matter to the site.

YELLOWPINE/COFFEEBERRY/BLUEGRASS
YP/RHRUM/POSA3

CPJSBB21

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	28
PIPOM	Ponderosa pine, midstory	100	2
CADET	Incensecedar, overstory	80	4
PIJEM	Jeffrey pine, midstory	80	3
CADEM	Incensecedar, midstory	60	2
PIJET	Jeffrey pine, overstory	40	13
Tree Understory Layer			
CADE3	Incensecedar	100	7
PIPO	Ponderosa pine	100	1
PIJE	Jeffrey pine	60	1
QUKE	California black oak	60	1
Shrubs			
CEPR	Mahala mat	100	7
PUTR	Bitterbrush	100	7
RHRUM	Modoc coffeeberry	100	4
AMPA2	Western serviceberry	80	1
ARPA9	Greenleaf manzanita	60	2
RHTRQ	Skunkbrush	40	1
CECU2	Wedgeleaf ceanothus	20	3
CEFL2	Ceanothus flexilis (hybrid)	20	1
Herbs			
LIMI	Common dwarf flax	100	1
WYMO	Mountain mulears	100	1
CLRH	Forest clarkia	80	1
Grasses & Sedges			
POSA3	Sandberg bluegrass	100	1
SIHY	Squirreltail	100	1
VUMI	Reflex annual fescue	80	1

Environment

Elev: 4656 (4560-4760)
Aspect: Mostly south-facing
Slope: 16 (16-16)
Landform: Mountaintops; upper and middle 1/3 slopes
R5 Site Class: 5 (4-5)

Special: Rhyolitic soils; low site; *Ceanothus x flexilis* hybrid.

Landscape Ecology and Environment

This plant association occurs on the sideslopes of mountains, hills and ravines, on rhyolitic soils. Slopes range from 5 to 30 percent, and are generally on southwest aspects. The type was sampled east of the Hat Creek rim, on the Hat Creek District, Lassen National Forest.

Vegetation

Dominant tree species are a mix of ponderosa pine, incensecedar, Jeffrey pine, black oak, and occasionally garry oak. The shrub understory is a diverse mix of "Eastside" shrubs such as Modoc coffeeberry and bitterbrush, and "westside" shrubs such as skunkbrush, twinberry, wedgeleaf ceanothus, birchleaf mountain mahogany, and the mahala mat-wedgeleaf ceanothus hybrid *Ceanothus x flexilus.*

Fire Ecology

These stands developed with periodic underburning. Older trees consistently show fire scars from multiple burns in the past. Many of the species in this type crown sprout when burned, including black oak and garry oak, skunkbrush, and greenleaf manzanita. Bitterbrush will decrease or disappear with high intensity fire, particularly hot fall fires with low soil moisture.

Soils

Soils are classified as mesic Lithic, Ultic, and typic Haploxerolls, Argixerolls, and Xerochrepts, over hard, fractured rhyolite.

Productivity and Management

Tree regeneration is low in this type because of shallow soil depths and low available water holding capacity. Site class is low. The type is composed of a rather unique diversity of shrubs that are valuable as wildlife browse and cover. Greenleaf manzanita will increase with high intensity or stand replacing fire.

SERIES AND TYPE DESCRIPTIONS

PINE-WHITE FIR SERIES

PINE-WHITE FIR SERIES

DISTRIBUTION AND ENVIRONMENT

The Pine-white fir series includes all sampled communities that have a mature or old growth pine overstory and a regeneration layer clearly dominated by white fir. White fir must also be present in older tree layers. White fir is an obvious component of these stands, and would have some kind of presence even with periodic underburning.

White fir is shade tolerant and the young trees are easily killed by fire. Fire exclusion practices have therefore given white fir a competitive edge in those communities with strong white fir potential.

Recent drought conditions have resulted in widespread mortality in younger white fir and even older pines in these stands, especially where stands are overstocked.

Both white fir-Jeffrey and white fir-ponderosa series stands are found in conditions that favor higher moisture than pure Jeffrey or ponderosa pine series stands. Pine-white fir series tend to occur on more northerly aspects, steeper slopes, higher elevations and areas with higher precipitation or snow accumulation than the pure pine series. White fir is often found on lower slopes and toeslopes where moisture and soil nutrients accumulate.

Species and structural diversity in these plant communities is high until such time as the pine are removed by logging or mortality, leaving even-aged white fir. Species and structural diversity in even-aged white fir is low compared to pine-dominated stands.

ASSOCIATED UNDERSTORY SPECIES

The most common shrub associates in the Pine-white fir plant communities are relatively shade tolerant, moisture indicating species such as serviceberry and mountain and spreading snowberry. Bitterbrush is a less common associate.

FIRE ECOLOGY

Fire exclusion in these types seems to favor eventual white fir dominance in some stands, although recent drought mortality events suggest that many sites may not support white fir to mature stand development. This is especially true of overstocked stands. Young white fir is easily killed by even low intensity fires, whereas mature or old-growth trees are relatively fireproof. Fire frequency in stands with white fir potential was longer than in ponderosa or Jeffery pine series stands. Selective pine overstory removal has also favored white fir succession. Many thousands of acres of formerly pine-dominated forest stands in the Eastside Pine region have succumbed to white fir dominance in the last 100 years.

See Appendix H for a generalized discussion of seral pathways for stands with dominant pine succession and for stands with white fir succession.

PRODUCTIVITY/MANAGEMENT

The Pine-white fir plant communities are usually more productive than pure pine stands in terms of wood fiber. The Ponderosa-white fir plant communities are more productive than either the Jeffrey-white fir or Washoe stands.

The most productive plant association sampled is the Ponderosa-White fir-Lodgepole/Serviceberry community sampled on the McCloud District, Shasta-Trinity N. F. The combination of deep, fertile soils, high soil moisture, and lengthy growing season contributes to the high wood fiber productivity of this plant community.

Shrub and herbaceous vegetation in these stands is often sparse because of high tree densities. Forage production is therefore lower than in pure ponderosa or Jeffrey pine series.

JEFFREY-WHITE FIR/BLUEGRASS//*GRANITE*
PIJE-ABCO/POA//GRANITE

CPJGBW11

Vegetation Summary Table
(Sample Size: 7)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	86	22
PSMET	Douglasfir, overstory	57	35
PIPOT	Ponderosa pine, overstory	57	25
ABCOM	White fir, midstory	57	6
PSMEM	Douglasfir, midstory	43	5
QUKEM	Black oak, midstory	29	2
Tree Understory Layer			
ABCO	White fir	100	2
Shrubs			
ARPA9	Greenleaf manzanita	57	2
PUTR	Bitterbrush	57	2
CEPR	Mahala mat	43	9
CELE3	Mountain mahogany	43	2
SYAC	Spreading snowberry	43	1
Herbs			
SEINM	Tower butterweed	100	1
ARLI	Woody rock cress	86	1
LUCA2	Spurred lupine	71	2
MINU1	Nodding microseris	71	1
WYMO	Mountain mulears	57	1
PEGR3	Slender penstemon	43	1
Grasses & Sedges			
PONE1	Wheeler bluegrass	100	1
POSA3	Sandberg bluegrass	83	1
SIHY	Squirreltail	57	1
CARO1	Ross' sedge	57	1

Environment

Elev: 5820 (5400-6200)
Aspect: North aspects
Slope: 34 (11-54)
Landform: Middle 1/3 slopes
R5 Site Class: 4 (3-5)

Special: Decomposed granite is highly erodible. Type transitions to dry mixed conifer.

Landscape Ecology and Environment

This plant association was sampled on the Diamond Mountain Escarpment, Milford District, Plumas National Forest. Slopes range from 11 to 54 percent on north exposures. Elevation ranges from 5400 to 6200 feet. The Diamond Mountain Escarpment is on the seam of two Floristic provinces; the Great Basin Floristic province and the northern high Sierra Nevada subregion of the California Floristic Province (Hickman ed. 1993).

Vegetation

Typical overstory vegetation in the type is a mix of Jeffrey pine, ponderosa pine, and douglas fir. Midstory vegetation includes these species as well as black oak and white fire. White fir is the regenerating tree species. The type is clearly transitional to a dry mixed conifer type, especially towards the top of the Diamond Mountain Escarpment.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Because of the north-facing, moisture retaining aspect, underburn fire return interval was probably longer than other Eastside Pine types; perhaps 40 to 50 years, and underburning probably occurred in a mosaic pattern. With continued fire exclusion, those stands that escape high intensity crown fires may progress to a mixed conifer type dominated by shade-tolerant conifers such as white fir, douglasfir, and incensecedar. Much of the type on the escarpment has recently experienced stand replacing fire in the burns of 1987 and 1988.

Soils

Soils are shallow to moderately deep, formed from granitic bedrock materials. Taxonomic families include sandy or loamy mixed, frigid, Typic or Entic Haploxerolls, Xerumbrepts, or Xerpsamments. Available water holding capacity at 20 inches is 1 to 2 inches, which is low compared to the other types in this field guide.

Productivity and Management

Tree seedling survival is variable on these soils because of low water holding capacity and very low organic matter content. On many sites these inherent soil limitations seem to be offset somewhat by favorable north aspects. These soils are also highly erosive because of the steep slopes and coarse, sandy soil texture. Management activities that build the organic matter content and litter layers will help build soil fertility on these sites.

JEFFREY-WHITE FIR/SNOWBERRY/BLUEGRASS
PIJE-ABCO/SYVA/PONE1

CPJSSY11

Vegetation Summary Table
(Sample Size: 9)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	41
ABCOM	White fir, midstory	89	92
PIJEM	Jeffrey pine, midstory	78	8
ABCOT	White fir, overstory	33	5
JUACM	Sierra juniper, midstory	33	4
Tree Understory Layer			
ABCO	White fir	89	1
PIJE	Jeffrey pine	78	2
Shrubs			
CEPR	Mahala mat	100	10
SYVA	Mountain snowberry	100	3
CEVE3	Snowbrush	67	4
CELE3	Mountain mahogany	67	1
AMPA2	Western serviceberry	67	1
HABL	Bloomer goldenbush	67	1
ARPA9	Greenleaf manzanita	44	2
ARTRV	Mountain big sagebrush	44	1
PUTR	Bitterbrush	44	1
Herbs			
MOODG	Mountain monardella	89	1
WYMO	Mountain mulears	78	1
SEINM	Tower butterweed	67	1
LUCA2	Spurred lupine	56	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
PONE1	Wheeler bluegrass	78	1
BROR1	Orcutt Brome	78	1
CARO1	Ross' sedge	56	1
STOC1	Western needlegrass	69	1

Environment

Elev: 6410 (5880-7240)
Aspect: All
Slope: 24 (6-45)
Landform: Middle and lower 1/ slopes of mountains
R5 Site Class: 3 (2-5)

Special: Snowberry; orcutt brome are moist site indicators. Higher elevation version of PIJE/PUTR-SYVA/POA.

Landscape Ecology and Environment

This plant association is similar to the PIJE/PUTR-SYVA/POA plant association, except that in this community white fir is much more evident and will probably eventually achieve type dominance if these stands escape replacement fires. White fir succession is more evident in this community because of generally higher precipitation, higher elevation, and frigid soil temperature regimes.

Vegetation

Jeffrey pine is currently dominant in these stands. White fir regeneration exceeds that of Jeffrey pine. Mountain snowberry (SYVA), a shade-tolerant shrub, is the characteristic shrub in the type. Shade-intolerant shrubs such as bitterbrush and mountain big sagebrush have low cover and constancy values. The type in general is comparatively moist and cool, as indicated by the presence of vegetation such as mountain snowbery and snowbrush.

Fire Ecology

This plant association developed with somewhat frequent, low intensity fire that burned through stands in a mosaic pattern. Fire return interval was probably about 40 or 50 years. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with underburning is more open and parklike, with fewer seedling, sapling, and pole-sized trees, fewer shrubs, and higher cover of herbaceous vegetation. Mountain snowberry, western serviceberry, greenleaf manzanita, and snowbrush will crown sprout following fires, and also germinate from seed where a seed bank is present. Excluding ground fires or lack of thinning can lead to the development of "doghair thickets" of small, suppressed Jeffrey pine and/or white fir with very little understory. These thickets are highly susceptible to high intensity wildfire and organisms such as dwarf mistletoe and mountain pine beetle.

Soils

Soil families include loamy-skeletal, loamy, and coarse loamy, frigid Argixerolls, Xerumbrepts, and Haploxerolls. Soils are moderately deep to deep, and are derived from andesite and basalt bedrock geology. Common names for the soils represented in this type are the Klicker, Franktown, Sattley, and Ledmount families.

Productivity and Management

Mechanical site preparation will be difficult in the stonier and steeper extremes of the type. Seedling survivability in the deeper, loamier soils in the type will be moderate to high. Fire exclusion and selective logging favor white fir in this type. Thinning from below or underburning to remove whitewood stems to favor Jeffrey pine may be a preferred practice in this type, if objectives are to favor pine species.

PONDEROSA-WHITE FIR-LODGEPOLE/SERVICEBERRY
PIPO-ABCO-PICO1/AMPA2

CPPSAM13

Vegetation Summary Table
(Sample Size: 10)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	50
PICOM	Lodgepole pine, midstory	70	3
ABCOM	White fir, midstory	60	13
ABCOT	White fir, overstory	30	27
Tree Understory Layer			
PIPO	Ponderosa Pine	100	2
ABCO	White fir	80	5
PICO1	Lodgepole pine	60	1
Shrubs			
AMPA2	Western serviceberry	100	6
RICE	Wax current	90	4
CEPR	Mahala mat	70	6
HABL	Bloomer goldenbush	50	3
PUTR	Bitterbrush	50	2
Herbs			
HOFUP	Dusky horkelia	80	2
KEGA	Kellogia	60	2
LANE	Sierra nevada pea	50	3
OSCH	Mountain sweetcicily	50	1
CHME2	Pipsissiwa	50	1
VIPU	Mountain violet	40	1
SEAR	California butterweed	40	1
Grasses & Sedges			
SIHY	Squirreltail	100	2
STOC1	Western needlegrass	70	4
ELGL	Blue wild rye	50	1
BROR1	Orcutt brome	40	1

Environment

Elev: 4644 (4570-4840)
Aspect: All
Slope: 5 (0-17)

Landform: Flats and concave areas.

R5 Site Class: 1 (0-2)

Special: Orcutt brome and blue wildrye are mesic site indicators.

Landscape Ecology and Environment

This plant community was sampled on the "McCloud Flats" and Toad area of the McCloud Ranger District, Shasta-Trinity National Forest. This area is a relatively recent thick deposit of pyroclastic cinders and ash from volcanic mudflows. Elevations range from 4570 to 4840 feet in the type plots. Average annual precipitation is about 32 inches. Many of these stands were logged around the turn of the century, and most of the plots were located in second growth stands.

Vegetation

Dominant overstory vegetation in the type is ponderosa pine, with white fir succession in the overstory and understory. Lodgepole pine is also a component of these stands. The most consistent shrub species in the type are western serviceberry and wax current. This plant community is seral to a white fir dominated plant type, although at present ponderosa pine regeneration is adequate to maintain a presence of ponderosa pine for the next 50-100 years. Young stands in this type (50-100 yr. tree age) have lower tree canopy closure and relatively high graminoid cover, especially squirreltail and western needlegrass. Other species favored by open canopy conditions and surface disturbance are bitterbrush and bloomer goldenbush. Applying fire or thinning fir and lodgepole from below is necessary to maintain ponderosa pine dominance in this community in the long term. .

Fire Ecology

These stands for the most part have not burned since they were logged in the last 80 to 100 years. Underburning favors ponderosa pine and tends to thin white fire and lodgepole pine.

Soils

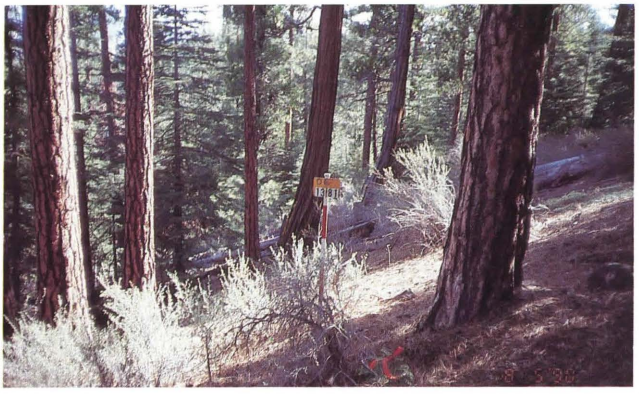
Soils were classified as fine-loamy, mixed, mesic Ultic Argixerolls. Soils are formed from basalt, cinders and ash. Soil depth is greater than 40 inches, and available water holding capacity is high. Coarse fragment percent is low.

Productivity and Management

This community is high site and is the most productive of the sampled Eastside Pine types. Potential for artificial tree regeneration is high because of the deep, loamy soils on flat aspects. Much of the area occupied by this community has already been clearcut and planted to ponderosa pine. Bloomer goldenbush is an aggressive competitor with planted trees on these sites, and can form an almost closed canopy. Gophers contribute to high seedling mortality because of ideal conditions for digging, denning, and foraging.

PONDEROSA-WHITE FIR-BLACK OAK/SERVICEBERRY
PIPO-ABCO-QUKE/AMPA2

CPPSAM14



Vegetation Summary Table
(Sample Size: 3)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	45
ABCOM	White fir, midstory	100	8
CADEM	Incensecedar, midstory	100	7
PIPOM	Ponderosa pine, midstory	100	4
Tree Understory Layer			
ABCO	White fir	100	6
QUKE	California black oak	100	1
CADE3	Incensecedar	67	3
PIPO	Ponderosa pine	67	1
Shrubs			
CEPR	Mahala mat	100	6
PUTR	Bitterbrush	100	2
AMPA2	Western serviceberry	100	1
CELE3	Mountain mahogany	100	1
ARPA9	Greenleaf manzanita	67	2
SYAC	Spreading snowberry	67	1
CEBEM	Longtail mtn. mahogany	33	1
Herbs			
PTAN	Pine drops	100	1
WYMO	Mountain mulears	100	1
PYPI	Greenvein shinleaf	100	1
HIAL	Whiteflower hawkweed	100	1
SEINM	Tower butterweed	100	1
BASA1	Arrowleaf balsamroot	67	1
LIWA	Washington lily	67	1
LANE	Sierra nevada pea	67	1
Grasses & Sedges			
CAMU1	Manystem sedge	100	1
SIHY	Squirreltail	100	1
BROR1	Orcutt brome	67	1
POCA3	Canby bluegrass	67	1

Environment

Elev: 4940 (4840-5020)
Aspect: All
Slope: 36 (31-40)
Landform: Upper and middle 1/ slopes on mountains.
R5 Site Class: 3 (2-4)

Special Type has a relatively uncommon shrub, *Cercocarpus macrouris*.

Landscape Ecology and Environment

This plant community is found in the Pit River watershed area of the Modoc National Forest. The type is found on mountainsides and near ravines. Elevations range from 4840 to 5020 feet, and average annual precipitation ranges from 18 to 20 inches.

Vegetation

This community is dominated by ponderosa pine, with shade-tolerant conifers scattered in the overstory. The most consistent regenerating tree species are white fir and black oak. This type at present appears to have the potential to eventually be dominated by white fir with continued fire exclusion. Understory shrub composition depends on overstory canopy cover. More open pine stands have higher cover of bitterbrush, and closed stands with high basal area have less bitterbrush and more serviceberry, which is a shade-tolerant shrub. Mountain mahogany is an indicator of stony sites. Black oak is almost always found in close proximity to incensecedar. Both species can be found on sites with extremes of soil temperature due to slope position, shallow soil depth, or both. Greenvein shinleaf and pine drops indicate high canopy closure and moist, cool sites.

Fire Ecology

These stands developed with periodic underburning. Large pine trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably 20 to 30 years on average prior to the extensive grazing and fire exclusion that started about 100 years ago. Black oak sprouts from the crown when burned, as do spreading snowberry, western serviceberry and greenleaf manzanita. Greenleaf manzanita has potential to dominate the shrub layer of this type following a high intensity fire.

Soils

Soils are fine-loamy, mixed, mesic, Pachic Ultic Argixerolls, and loamy-skeletal, mixed, frigid, Ultic Haploxerolls. Available water holding capacity is about 3 inches in the top 20 inches of soil.

Productivity and Management

This plant community is moderately productive for wood fiber. Natural regeneration of white fir is high, whereas ponderosa pine regeneration is less prevalent. Black oak mast is an important wildlife forage. The type is used sparsely if at all by domestic livestock.

PONDEROSA-WHITE FIR/SERVICEBERRY-OREGONGRAPE
PIPO-ABCO/AMPA2-BERE **CPPSAM15**

Vegetation Summary Table
(Sample Size: 8)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	58
PIPOM	Ponderosa pine, midstory	75	7
ABCOM	White fir, midstory	75	16
ABCOT	White fir, overstory	22	11
Tree Understory Layer			
ABCO	White fir	100	4
PIPO	Ponderosa pine	88	2
JUOC	Western juniper	25	1
Shrubs			
AMPA2	Western serviceberry	100	11
SYVA	Mountain snowberry	75	1
BERE	Oregongrape	75	2
ROWOU	Interior rose	38	1
RIVI	Sticky current	38	1
CEPR	Mahala mat	25	7
CELE3	Mtn. mahogany	13	1
Herbs & Graminoids			
ARCO3	Heart-leaved arnica	100	11
OSCH	Mountain sweetcicily	75	3
STJA	Sticky starwort	63	2
LUCA2	Tailcup lupine	63	1
HIHO	Shaggy hawkweed	63	1
PYPID	Wintergreen	63	1
SMST	Solomon's seal	63	1
LANE	Sierra nevada pea	63	1
CHUMO	Prince's pine	50	1
SEINM	Tower butterweed	50	1
PONE1	Wheeler bluegrass	88	2
SIHY	Squirreltail	50	1
ELGL	Smooth wildrye	38	1
POCA3	Canby bluegrass	38	1

Environment

Elev: 5922 (5200-6480)
Aspect: All
Slope: 32 (12-50)

Landform: Middle and lower slopes of mountains.

R5 Site Class: 3 (2-4)

Special: Mesic type, productive White fir succession.

Landscape Ecology and Environment

This plant community is found on mountain sideslopes in the Warner Mountains. Slopes range from 10 to 50 percent. Elevations range from 5200 feet to 6500 feet. Lower elevation sites (less than 6000 feet) tend to occur on north exposures, and higher elevation sites tend to occur on more southerly exposures. Average annual precipitation ranges from 20 to 25 inches. This type is closely related to the Ponderosa/Serviceberry/Heartleaf Arnica plant association, except that this type is clearly exhibiting white fir succession.

Vegetation

Dominant tree vegetation at the present time is ponderosa pine. White fir and ponderosa pine share the tree regeneration. Understory shrub vegetation includes western serviceberry, mountain snowberry, and oregongrape. Prominent herbaceous vegetation includes heart-leaved arnica, mountain sweetcicily, sticky starwort, and wheeler bluegrass. Average Dunning Site Index is 80, and average R-5 site class is 3. Stand density and tree canopy closure are high, and because of this understory vegetation is sparse. Heartleaf arnica is a well-known medicinal herb used externally for reducing inflammations.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. The appearance of these stands with low intensity fire is more open and parklike, with less white fir and advance pine regeneration and more herbaceous vegetation. White fir succession is prominent and this species will eventually dominate, assuming that these stands escape stand replacing burns or other kinds of mortality in for the next 100 years or so. These sites have potential for an increase in snowbrush density if subjected to a hot fire. Serviceberry and spreading snowberry will resprout following low and moderate intensity fires. These stands readily develop "doghair thickets" of stagnant, small diameter pine and fir unless thinned mechanically or by fire.

Soils

Soils are greater than 40 inches deep and are formed from hard fractured basalt or andesite or weathered volcanic tuff. Soils are in the Smarts and Patio families, which are common names for loamy-skeletal, mixed, frigid, Pachic and Ultic Haploxerolls and Argixerolls. Available water holding capacity ranges from 1 to 3 inches in the top 20 inches of soil. Litter inputs and duff depths are high, contributing to soil organic matter and vegetation productivity.

Productivity and Management

Survival potential for natural or planted regeneration is moderate to high. Prescribed underburns will favor pines and thin white fir and western juniper.

PONDEROSA-WHITE FIR/SERVICEBERRY-SNOWBRUSH/BROME
PIPO-ABCO/AMPA2-CEVE3/BROR1 **CPPSAM16**

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	59
ABCOT	White fir, overstory	80	12
ABCOM	White fir, midstory	60	3
PIPOM	Ponderosa pine, midstory	60	3
CADEM	Incensecedar, midstory	40	2
Tree Understory Layer			
PIPO	Ponderosa Pine	100	2
ABCO	White fir	100	1
Shrubs			
AMPA2	Western serviceberry	100	4
PUTR	Bitterbrush	100	1
CEVE3	Snowbrush	80	16
ARPA9	Greenleaf manzanita	80	2
HABL	Bloomer goldenbush	80	1
CHSE2	Bush chinquapin	60	2
PREM	Bitter cherry	40	10
Herbs			
LANE	Sierra nevada pea	60	4
IRTE	Iris	86	2
HOFUP	Dusky horkelia	60	1
FRPL1	Scarlet strawberry	50	12
Grasses & Sedges			
BROR1	Orcutt Brome	100	1
SIHY	Squirreltail	80	1
CABR5	Short sedge	40	1
ELGL	Blue wild rye	20	3

Environment

Elev: 4612 (4480-4760)
Aspect: All
Slope: Mostly flat

Landform: Flat areas of pyroclastic mudflows from Mt. Shasta.

R5 Site Class: 2 (1-2)

Special: Orcutt brome is a mesic site indicator.

Landscape Ecology and Environment

This plant community is found on nearly level basalt plateaus with a relatively recent thick deposit of pyroclastic cinders and ash from volcanic mudflows. Additional moisture may be available to some sites from drainage from non-vegetated lava flows nearby. Elevations range from 4480 to 4760 feet in the type plots. Average annual precipitation is about 31 inches. This type was sampled on the McCloud District, Shasta-Trinity National Forest. The type is high site and very productive in comparison to the other Eastside Pine plant associations and communities described in this report.

Vegetation

Dominant overstory vegetation in the type is ponderosa pine with white fir succession. A variety of shrubs is present, including bitterbrush, pallid serviceberry, snowbrush, bush chinquapin and bitter cherry. With continued fire exclusion, white fir will eventually become dominant. The current density of snowbrush and greenleaf manzanita is a reflection of a family recent burn event, probably in the last 60 years. These species are not shade tolerant, and will eventually die out. Short sedge , blue wild rye, and Orcutt brome indicate mesic site conditions.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 50 years. The appearance of these stands with low intensity fire is more open and parklike, with fewer shrubs and probably more herbaceous vegetation. The type has potential for high cover of greenleaf manzanita and snowbrush following a hot fire.

Soils

Soils are in the Germany and Holland families and are formed in cinders, basalt, and ash. Soils are classified as medial, mesic, Andic Xerumbrepts, and fine-loamy, mixed, mesic, Ultic Haploxeralfs. Soil depth is greater than 40 inches, and available water holding capacity is high. Coarse fragment percent is low.

Productivity and Management

Tree seedling regeneration potential in this type is moderate or high. Mechanical site preparation will be accomplished with relative ease. Severe soil disturbance from logging and site preparation can result in near-monotypic stands of *Haplopappus bloomeri*. This plant association is a diverse and productive nesting and feeding habitat for a variety of wildlife species, especially songbirds, raptors, and other bird life. Numerous songbird nests were observed in tall bitter cherry shrubs when the type was sampled. The type is valuable mule deer habitat because of the diversity of browse species, and because of the high hiding and thermal cover.

PONDEROSA-WHITE FIR/SPREADING SNOWBERRY
PIPO-ABCO/SYAC **CPPSSS11**

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	46
CADET	Incensecedar, overstory	100	7
ABCOM	White fir, midstory	100	6
ABCOT	White fir, overstory	60	6
PIPOM	Ponderosa pine, midstory	60	3
CADEM	Incensecedar, midstory	60	2
Tree Understory Layer			
PIPO	Ponderosa pine	100	2
ABCO	White fir	100	1
CADE3	Incensecedar	80	1
Shrubs			
CEPR	Mahala mat	100	11
SYAC	Spreading snowberry	100	1
ARPA9	Greenleaf manzanita	80	3
CEVE3	Snowbrush	80	1
PUTR	Bitterbrush	60	2
AMPA2	Western serviceberry	60	1
CELE3	Mtn. mahogany	20	2
Herbs			
PYPID	Wintergreen	80	1
ARHOR	Holboell's rock cress	60	1
PTAN	Pine drops	60	1
APPU	Mountain hemp	40	1
SEINE	California butterweed	40	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	80	1
STOC1	Western needlegrass	80	1
POCA3	Canby bluegrass	40	1
BROR1	Orcutt brome	40	1
FEID	Idaho fescue	40	1

Environment

Elev: 5704 (5400-6040)
Aspect: All
Slope: 20 (4-32)
Landform: Lower and middle 1/3 slopes.
R5 Site Class: 3 (3-4)

Special: Transitional to white fir type.

Landscape Ecology and Environment

This plant community is found in a variety of sites ranging from gently sloping to moderately steep sideslopes of mountains, hills, and cinder cones on near level to 32 percent slopes. Exposures are variable, and elevations range from 5400 to 6040 feet. Average annual precipitation ranges from 18 to 30 inches.

Vegetation

Dominant overstory and understory vegetation is characterized by ponderosa pine and occasionally white fir. The shrub layer is typically dominated by greenleaf manzanita, snowbrush, spreading snowberry and bitterbrush, while the herbaceous layer is characterized by wintergreen, pinedrops, and western needlegrass. This plant community is intermediate between a ponderosa pine series and white fir series. The community is found usually upslope of ponderosa pine associations. White fir is a biological potential species regardless of seral stage because of aspects, slope position, elevation and precipitation. Plant indicators of moister, upslope conditions are white fir, snowbrush, spreading snowberry, wintergreen, and solomon's seal.

Fire Ecology

These stands developed with periodic underburning. Older trees consistently show fire scars from multiple burns in the past. Several of the shrub species in this type crown sprout when burned, including greenleaf manzanita, snowbrush, and western serviceberry. Continued fire exclusion and pine overstory removal in this type is resulting in white fir stand domination. If a landscape goal is to maintain pine species in these stands in the long term, then thinning or re-introducing fire will be necessary. Greenleaf manzanita, snowbrush, and possibly rabbitbrush goldenweed will aggressively occupy these sites following high intensity fire.

Soils

Soils are loams, sandy loams, and cobbly loams formed over hard fractured basalt and weathered andesite. Depths range from 17 inches to over 40 inches. Taxonomic classifications include loamy-skeletal, mixed, frigid Lithic and Ultic Haploxeralfs, and loamy-skeletal, mixed, mesic Pachic Ultic Argixerolls.

Productivity and Management

Tree seedling survival is moderate to good in this type. Seedling plantability will be difficult when the rock content of the soil is high. Prescribed underburns will tend to favor pine and thin white fir and incensecedar. These stands readily develop "doghair thickets" of stagnant, small diameter pine and fir in the absence of activities to thin the trees, such as mechanical thinning or underburning.

PONDEROSA-WHITE FIR/SNOWBRUSH/NEEDLEGRASS
PIPO-ABCO/CEVE3/STOC1

CPPSBB21

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa Pine, overstory	100	43
ABCOM	White fir, midstory	100	3
ABCOT	White fir, overstory	20	7
CADE3	Incensecedar, overstory	20	5
Tree Understory Layer			
PIPO	Ponderosa Pine	100	1
ABCO	White fir	80	1
Shrubs			
CEVE3	Snowbrush	100	6
PUTR	Bitterbrush	100	6
PREM	Bitter cherry	80	7
ARPA9	Greenleaf manzanita	80	6
PRVID	Chokecherry	80	3
AMPA2	Western serviceberry	80	2
CEPR	Mahala mat	60	4
RICE	Wax current	60	2
HABL	Bloomer goldenbush	60	1
CELE3	Mountain mahogany	60	1
RHRUM	Modoc coffeeberry	40	1
Herbs			
MOODG	Mountain monardella	80	2
ERNU2	Naked buckwheat	60	1
GAHE	Heller's groundsmoke	40	2
Grasses & Sedges			
STOC1	Western needlegrass	100	2
SIHY	Squirreltail	100	1
BROR1	Orcutt Brome	40	2
CARO1	Ross' sedge	40	1
CAIN2	Long-stoloned sedge	20	10

Environment

Elev: 4612 (4000-5480)
Aspect: All
Slope: Mostly flat

Landform: On and adjacent to undulating basalt lava flows, Modoc Plateau Physiographic Region.

R5 Site Class: 2 (1-4)

Special: High production lava flow type.

Landscape Ecology and Environment

This plant community was sampled on the McCloud District, Shasta-Trinity National Forest, and on the Eagle Lake District, Lassen National Forest. The type is usually found on or between relatively recent lava flows in reef-like formations on nearly level to gently sloping basalt plateaus. One plot was located on the extremely rocky sideslope of a basalt shield volcano.

Vegetation

Older stands are dominated by ponderosa pine, and regenerating tree species composition is shared by ponderosa pine and white fir. Understory shrub and herbaceous vegetation is richly diverse due to the variety of microsites that occur on weathered basalt lava flows. Shrub cover can be high, ranging from 7 to 50 percent, and a variety of shrub species are present, including snowbrush, bitterbrush, bitter cherry, western serviceberry, chokecherry, Sierra plum, wax current, mahogany, and Modoc coffeeberry. Forb and grass species with high constancy include mountain monardella, naked buckwheat, western stipa, and, less frequently, orcutt brome. White fir will eventually dominate in many microsites, although some pine will always be evident in these stands because of the mosaic of regeneration sites in, among, and between the rock lava flow formations. Greenleaf manzanita and snowbrush cover will eventually diminish in some sites with increasing tree canopy closure.

Fire Ecology

Pre-fire exclusion fire regime in this type was probably complex. The type is full of natural firebreaks from rock outcrops. Low intensity understory fires probably burned in some areas; some isolated areas experienced hot crown fires, and some areas have probably never burned at all. The current high cover levels of snowbrush and greenleaf manzanita in many sites suggests that this type experienced a hot burn sometime in the last 60 years.

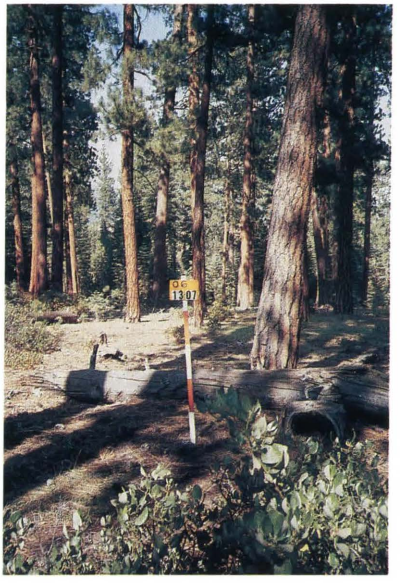
Soils

Soils are classified as medial, mesic, Andic Xerumbrepts and loamy-skeletal, mixed, frigid Ultic Haploxeralfs. Soils are in the Germany and Anvil families. Available water holding capacity in the lithic soils ranges from less than 1.0 inches to 1.5 inches. Available water holding capacity in the "flower pot" depressions with deep soils fluctuates widely from 1.8 to greater than 6.0 inches in the top 40 inches of soil.

Productivity and Management

This plant community is more productive in terms of wood fiber than the other lava flow types sampled in this study. This is because of the relatively high precipitation (31"), and because of fertile, deep soils in the "flower pot" depressions. Uneven aged management strategies should give good results in this plant community. The type is important deer winter range, and provides foraging and nesting habitat for a variety of raptors and neotropical migrant birds.

PONDEROSA-WHITE FIR/BITTERBRUSH-MANZANITA/NEEDLEGRASS
PIPO-ABCO/PUTR-ARPA9/STOC1 **CPPSBB22**



Vegetation Summary Table
(Sample Size: 11)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	49
PIPOM	Ponderosa pine, midstory	82	6
ABCOM	White fir, midstory	64	5
PICOM	Lodgepole pine, midstory	27	2
PIJET	Jeffrey pine, overstory	18	10
Tree Understory Layer			
PIPO	Ponderosa pine	100	3
ABCO	White fir	82	1
Shrubs			
CEPR	Mahala mat	100	13
ARPA9	Greenleaf manzanita	91	7
PUTR	Bitterbrush	64	2
HABL	Bloomer goldenbush	55	1
CEVE3	Snowbrush	45	4
Herbs			
KEGA	Kellogia	82	1
APPU	Mountain hemp	64	1
MOODG	Mountain monardella	64	1
LUCA2	Spurred lupine	45	1
PYPID	Wintergreen	45	1
WYMO	Mountain mule ears	36	2
PEGR3	Slender penstemon	36	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	91	1
CARO1	Ross' sedge	91	1

Environment

Elev: 5886 (5650-6450)
Aspect: All
Slope: 11 (4-21)

Landform: Middle and lower 1/3 slopes of mountains.

R5 Site Class: 3 (2-3)

Special: Greenleaf manzanita and snowbrush will eventually shade out and have reduced cover in the stand.

Landscape Ecology and Environment

This plant association occurs on gently sloping to moderately steep sideslopes of mountains, hills and cinder cones on level to 21 percent slopes. Exposures are variable, and elevations range from 5650 to 6450 feet. Average annual precipitation ranges from 20 to 40 inches.

Vegetation

Dominant overstory tree vegetation is ponderosa pine with some white fir in the midstory. Ponderosa pine and white fir are the primary regenerating species. Jeffrey pine is a low constancy component in the type. The shrub and herbaceous understory vegetation are characterized by greenleaf manzanita, bitterbrush, kellogia, mountain monardella, and western needlegrass. This plant community may eventually be dominated by white fir, although ponderosa pine regeneration is currently adequate to maintain a strong pine presence in these stands for some time. The fire sprouting shrubs (greenleaf manzanita and sometimes snowbrush) so evident in these stands now will eventually be shaded out, and average cover of these shrubs will be reduced.

Fire Ecology

The high constancy of greenleaf manzanita and snowbrush indicates that sites in this community were subject to high intensity fire at some time in the relatively recent past. This is particularly true when cover of these fire-sprouting species exceeds ten percent. Greenleaf manzanita and snowbrush seem to exhibit reduced cover when overstory tree canopy closure reaches about 60 percent. Snowbrush is more shade-tolerant than greenleaf manzanita. The type has been excluded from fire for the most part for at least 80 years.

Soils

Soils are loams, sandy loams, and cobbly loams formed over hard fractured basalt and weathered andesite. Soil taxa include loamy-skeletal, mixed, frigid, Ultic Argixerolls; loamy-skeletal, mixed, frigid, Ultic Haploxerolls, and fine-loamy, mixed, frigid, Ultic Haploxeralfs. One plot was classified as a Dystric Xerochrept. Soil depths range from 27 inches to over 40 inches.

Productivity and Management

Survivability of planted trees will be less successful in the shallower soils of this type because of lower available water holding capacities. Mountain mulears appears from the data to be an indicator of lower site productivity.

YELLOWPINE-WHITE FIR/HUCKLEBERRY OAK/MULEARS
YP-ABCO/QUVA/WYMO

CPJSOH11

Vegetation Summary Table
(Sample Size: 3)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	27
PIJET	Jeffrey pine, overstory	100	19
ABCOM	White fir, midstory	67	4
PIPOM	Ponderosa pine, midstory	67	2
PIJEM	Jeffrey pine, midstory	67	1
ABCOT	Overstory white fir	33	7
Tree Understory Layer			
ABCO	White fir	100	1
PIJE	Jeffrey pine	67	1
PIPO	Ponderosa pine	33	1
Shrubs			
CEPR	Mahala mat	100	7
QUVA	Huckleberry oak	100	7
PUTR	Bitterbrush	100	7
ARPA9	Greenleaf manzanita	100	2
CEVE3	Snowbrush	67	1
CELE3	Mtn. mahogany	67	1
SYAC	Spreading snowberry	33	1
PELE	Lemmon beardtongue	33	1
Herbs & Graminoids			
WYMO	Mountain mulears	100	4
LUCA2	Spurred lupine	100	2
ARHOR	Holboell's rock cress	67	1
SEINM	Tower butterweed	67	1
ERNU3	Naked buckwheat	67	1
SIHY	Squirreltail	100	1
POCA3	Canby bluegrass	67	1
CARO1	Ross' sedge	67	1
PONE1	Wheeler bluegrass	33	3
STOC1	Western needlegrass	33	1
CABR5	Short sedge	33	1

Environment

Elev: 6533 (6400-6600)
Aspect: Southfacing
Slope: 28 (25-33)
Landform: Upper and middle 1/3 slopes on mountains.
R5 Site Class: 4 (4-5)

Special: Edge of the Eastside Pine region.

Landscape Ecology and Environment

This plant community was sampled on the Tahoe National Forest, although it probably occurs elsewhere in the study area in the interface between westside Sierra Nevada mixed conifer types and the more xeric Eastside Pine types.

Vegetation

Ponderosa pine and Jeffrey pine are dominant and reproducing at the present time. White fir is prevalent in the midstory and regeneration layers, and will eventually dominate these stands in the absence of burning or understory thinning. Huckleberry oak grows in dry, gravelly, exposed sites in the northern Sierra Nevada and Cascade mountains, but it's an uncommon species in the interior Eastside Pine area considered in this guide.

Fire Ecology

This community is maintained by edaphic conditions (exposed site; shallow, rocky and gravelly soils), and by periodic low intensity fire. Large trees consistently show fire scars from multiple burns in the past. Fire return interval was probably 20 to 30 years on average prior to extensive logging, grazing and fire exclusion that started about 100 years ago. Appearance of older stands with a presettlement fire frequency was open and parklike, with fewer shrubs and more herbaceous vegetation than at present.

Soils

The soils are in the Franktown and Kyburz families, and are Lithic and Lithic Ultic Haploxeralfs. Soil temperature regime is frigid.

Productivity and Management

The tree productivity of the type is in the lower 1/3 of the sample types because of the limitations imposed by the exposed, rocky sites. Huckleberry oak acorns (mast) are relished by deer and numerous species of birds and small mammals.

YELLOWPINE-WHITE FIR/INTERIOR LIVE OAK
YP-ABCO/QUWI

CPJSBB23

Vegetation Summary Table
(Sample Size: 2)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	100	31
CADET	Incensecedar, overstory	100	13
ABCOM	White fir, midstory	100	4
CADEM	Incensecedar, midstory	100	3
PIJET	Jeffrey pine, midstory	50	5
JUOCM	Western juniper, midstory	50	1
Tree Understory Layer			
CADE3	Incensecedar	100	1
PIPO	Ponderosa pine	100	1
ABCO	White fir	50	1
Shrubs			
PUTR	Bitterbrush	100	21
CELE3	Mtn. mahogany	100	5
CEPR	Mahala mat	100	3
CEBE2	Birchleaf mahogany mah	100	2
QUGA	Interior live oak (shrub)	100	1
POCO6	Sierra milkwort	100	2
RIMO	Alpine prickly current	100	1
SYAC	Spreading snowberry	100	1
AMPA2	Western serviceberry	100	1
RHRTQ	Skunkbrush	100	1
RHRUM	Modoc coffeeberry	100	1
Herbs & Grasses			
ARSP2	Sicklepod rock cress	100	1
BASA1	Arrowleaf balsamroot	100	1
CAMU2	Manystem sedge	100	1
SIHY	Squirreltail	100	1
POA sp.	Canby,Sandbrg bluegrass	100	2
CABR5	Brainerd's sedge	50	1

Environment

Elev: 4960 (4880-5040)
Aspect: Southwest
Slope: 42 (40-43)
Landform: Mountaintops; upper and middle 1/3 slopes
R5 Site Class: 4 (4-4)

Special: Near the Hat Creek rim; unusual species composition & diversity.

Landscape Ecology and Environment

Two samples were collected in this uncommon type. Both were located near the Hat Creek Rim, Lassen National Forest. The sampled stands were on a very stony southwest-facing mountain sideslope.

Vegetation

The type is dominated by ponderosa pine with a lesser component of Jeffrey pine. White fir may eventually dominate the type in the continued absence of fire, although at present the shade-intolerant pine species are also regenerating successfully. This community type has an interesting and very diverse mixture of "Eastside" and "foothill-westside" vegetation components that is unique in the Eastside Pine area. Eastside components include bitterbrush, modoc coffeeberry and western juniper; while "westside" vegetation is represented by interior live oak, birchleaf mountain mahogany, and chaparral honeysuckle.

Fire Ecology

These stands developed with periodic underburning. Older trees show fire scars from multiple burns in the past. Many of the species in this type crown sprout when burned, including interior live oak, skunkbrush, and greenleaf manzanita. Bitterbrush will decrease or disappear with high intensity fire, particularly hot fall fires with low soil moisture.

Soils

The sampled soils were loamy-skeletal, mixed, frigid, Ultic Haploxerolls.

Productivity and Management

Artificially regenerating trees in this type is impractical because of the high rock content and low available water holding capacity. The type is composed of a rather unique diversity of shrubs that are valuable as wildlife browse and cover. Greenleaf manzanita will increase with high intensity or stand replacing fire.

YELLOWPINE-WHITE FIR/NEEDLEGRASS//*ASH*
YP/STOC1//ASH **CPJGNG11**

Vegetation Summary Table
(Sample Size: 5)

		Cons	Cov
Tree Overstory Layer			
PIPOT	Ponderosa pine, overstory	80	25
PIJET	Jeffrey pine, overstory	80	20
ABCOT	White fir, overstory	40	13
PIJEM	Jeffrey pine, midstory	40	10
PIPOM	Ponderosa pine, midstory	40	5
ABCOM	White fir, midstory	40	5
Tree Understory Layer			
ABCO	White fir	80	1
PIPO	Ponderosa pine	60	1
Shrubs			
HABL	Bloomer goldenbush	40	1
Herbs			
PYPID	Wintergreen	60	1
PEGR3	Slender penstemon	60	1
ERNU3	Naked buckwheat	40	1
Grasses & Sedges			
STOC1	Western needlegrass	100	2
SIHY	Squirreltail	100	1
CARO1	Ross' sedge	80	1

Environment

Elev: 6136 (6080-6160)
Aspect: All
Slope: 9 (3-12)
Landform: Upper, mid, lower 1/3 slopes of mountains.
R5 Site Class: 2 (1-3)

Special: White fir is successional in this type. Sampled near Butte Lake, Lassen National Park.

Landscape Ecology and Environment

This plant community was sampled in Lassen Volcanic National Park near Butte Lake. The type extends into Lassen National Forest to the north. Elevations range from about 6000 to 6200 feet, and slopes range from 0 to 15 percent. This type occurs on a relatively recent pyroclastic ash flow that probably originated from the Cinder Cone mountain in Lassen Volcanic National Park several centuries ago.

Vegetation

Overstory vegetation is a mix of Jeffrey pine, ponderosa pine, and overstory and midstory white fir. White fir is successional to the pine species with fire exclusion. Shrubs are sparse in undisturbed stands with the exception of an occasional specimen of bloomer goldenbush (*Happlopappus bloomeri*). Perennial herbaceous vegetation is characterized by slender penstemon and western needlegrass.

Fire Ecology

These stands developed with periodic underburning. Large trees consistently show fire scars from multiple burns in the past. Underburn fire return interval was probably fairly lengthy as well as patchy as there are mature and old growth white fir scattered throughout these stands. The community is maintained in a pine-dominated state by removing regenerating white fir. The National Park Service has recently conducted prescribed underburns in this community in the vicinity of Butte Lake with the objective of maintaining and regenerating the pine stand.

Soils

Soils are greater than 40 inches deep and are formed from volcanic cinders, ash, and basalt. Texture is sandy. Soils have a relatively recent ash overburden 15 to 30 inches thick. Available water holding capacity ranges from 1 to 2 inches in the top 20 inches of soil. The soils are classified as frigid, Ultic Haploxerolls and frigid, Entic Dystandepts, in the Ahart and Sheld families.

Productivity and Management

Stands within the Lassen Volcanic National Park are managed for biodiversity and old growth values, and the park also conducts research on underburning effects. The pine stands north of Butte Lake within the park are among the largest continuous old growth stands remaining in the Eastside Pine region, and these stands are also easily accessed. In managed stands, regeneration potential for seedling trees is high, and mechanical site preparation is accomplished easily. Soil disturbance and overstory tree removal favors the establishment and spread of bloomer goldenbush (*Happlopappus bloomeri*).

YELLOWPINE-WHITE FIR/SPREADING SNOWBERRY/MULEARS
YP-ABCO/SYAC/WYMO **CPJSSS12**

Vegetation Summary Table
(Sample Size: 12)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	44
PIJEM	Jeffrey pine, midstory	83	5
ABCOM	White fir, midstory	83	37
PIPOT	Ponderosa pine, overstory	67	25
CADEM	Incensecedar, midstory	50	3
JUACM	Sierra juniper, midstory	42	2
PIPOM	Ponderosa pine, midstory	33	2
Tree Understory Layer			
PIJE	Jeffrey pine	75	2
ABCO	White fir	50	1
CADE3	Incensecedar	33	2
PIPO	Ponderosa pine	17	2
Shrubs			
ARPA9	Greenleaf manzanita	100	5
SYAC	Spreading snowberry	100	4
PUTR	Bitterbrush	92	5
AMPA2	Western serviceberry	67	1
CELE3	Mtn. mahogany	50	1
Herbs			
WYMO	Mtn. mulears	92	2
ARHOR	Holboell's rock cress	67	1
MOODG	Mountain monardella	58	1
ERNU3	Naked buckwheat	58	1
BASA1	Arrowleaf balsamroot	50	1
PEDEH	Hot rock penstemon	50	1
Grasses & Sedges			
SIHY	Squirreltail	100	1
STOC1	Western needlegrass	67	1
CARO1	Ross' sedge	67	1
BROR1	Orcutt brome	58	1
POCA3	Canby bluegrass	50	1

Environment

Elev: 6310 (5760-7160)
Aspect: Southerly
Slope: 27 (6-55)
Landform: Upper, middle, and lower slopes of mountains.
R5 Site Class: 4 (3-4)

Special: Transitional to white fir type.

Landscape Ecology and Environment

This plant community is found on stony mountain slopes and ravine edges. Slopes range from 6-55 percent and elevation ranges from 5760 to 7200 feet. Precipitation ranges from 20 to 40 inches. The type was sampled on the Tahoe, Lassen, and Plumas National Forests.

Vegetation

Currently, dominant tree vegetation is Jeffrey pine, with a mix of spreading snowberry, servicebery, greenleaf manzanita and bitterbrush most prominent in the shrub understory. Ponderosa pine is present and regenerating in most stands. White fir appears to be the eventual dominant tree in this type with continued fire exclusion.

Fire Ecology

These stands developed with periodic underburning. Older trees consistently show fire scars from multiple burns in the past. Several of the shrub species in this type crown sprout when burned, including greenleaf manzanita, spreading snowberry, and western serviceberry. Continued fire exclusion and pine overstory removal in this type is resulting in white fir stand occupation. If a landscape goal is to maintain pine species in these stands in the long term, then thinning or re-introducing fire will be necessary. Greenleaf manzanita and possibly snowbrush and mulears will aggressively occupy these sites following high intensity fire.

Soils

Soils are loamy-skeletal, mixed, frigid Haploxeralfs, Argixerolls, Haploxerolls, and Xerumbrepts, in the Franktown, Euer, Klicker, Jorge, and Sattley families. Surface rock percent and A horizon coarse fragment percent are high.

Productivity and Management

This plant community is below the average in cubic foot productivity when compared with the other pine-white fir plant communities. Aspects are generally hotter and drier compared to the other types, and these sites can be rocky with shallow soils. Artificially regenerating trees may be difficult because of site limitations. The high constancy of mulears indicates that this species may have potential to increase dramatically following fire or other site disturbance. Mulears is a formidable and persistent competitor with other vegetation because of its root structure and allelopathic characteristics (Yoder-Williams 1987).

YELLOWPINE-WHITE FIR/SERVICEBERRY-OREGONGRAPE/
YP-ABCO/AMPA2-BERE **CPJSAM12**

Vegetation Summary Table
(Sample Size: 2)

		Cons	Cov
Tree Overstory Layer			
PIJET	Jeffrey pine, overstory	100	28
ABCOM	White fir, midstory	100	12
PIJEM	Jeffrey pine, midstory	100	4
PIPOT	Ponderosa Pine, overstory	50	10
PIPOM	Ponderosa Pine, midstory	50	10
ABCOT	White fir, overstory	50	2
Tree Understory Layer			
ABCO	White fir	100	3
PIJE	Jeffrey pine	100	2
PIPO	Ponderosa Pine	50	2
Shrubs			
AMPA2	Western serviceberry	100	1
BERE	Oregongrape	100	1
SYVA	Mountain snowberry	100	1
CELE3	Mtn. mahogany	50	5
ROWOU	Interior rose	50	1
CEPR	Mahala mat	50	1
RIVE	Plateau gooseberry	50	1
Herbs & Graminoids			
SOMU	Northern goldenrod	100	2
ERLA6	Common woolysunflower	100	1
SIME	Menzie's catchfly	50	2
STCO4	Heart-leaved jewelflower	50	1
SECA3	Wooly butterweed	50	1
ARCO3	Heart-leaved arnica	50	1
STJA	Sticky starwort	50	1
CARO1	Ross' sedge	100	2
PONE1	Wheeler Bluegrass	100	1
SIHY	Squirreltail	100	1
BROR1	Orcutt brome	100	1
MEBU2	Bulbous melic	50	1

Environment

Elev: 5840 (5720-5960)
Aspect: Southerly or flat
Slope: 27 (15-38)

Landform: Lower slopes and bottoms.

R5 Site Class: 3 (3-3)

Special: Closely related to PIPO/AMPA2-BERE/ARNICA and PIPO-ABCO/AMPA2-BERE types; this type has PIJE in addition to PIPO.

Landscape Ecology and Environment

This plant association is found on mountain sideslopes in the southern part of the Warner Mountain District, Modoc National Forest. Elevations range from 5720 to 5960 feet. Average annual precipitation in the two measured plots is estimated at 20 inches. Stand density and tree canopy cover are high, and shrub and herbaceous understory is sparse compared to the more open Eastside Pine types because of the high overstory canopy closure. This type is closely related to the Ponderosa-white fir/serviceberry-oregongrape plant community. The major difference between the two communities is that this type includes overstory and reproducing Jeffrey pine.

Vegetation

Typical vegetation consists of Jeffrey pine, ponderosa pine, white fir, serviceberry, mountain snowberry, oregongrape, heartleaf arnica, and wheeler bluegrass. Interior rose indicates additional moisture on the site, either from juxtaposition to ephemeral or perennial riparian areas or from subterranean drainage from adjacent land features. Mechanically disturbed stands have little or no heartleaf arnica, and other herbaceous species are reduced as well. Heartleaf arnica is a well-known medicinal herb used externally for reducing inflammations.

Fire Ecology

This plant association developed with frequent, low intensity fire. The type has been excluded from fire for the most part for at least 80 years. These stands readily develop "doghair thickets" of stagnant, small diameter pine and fir in the absence of activities to thin the trees, such as mechanical thinning or underburning. The appearance of these stands with low intensity fire is more open and parklike, with less understory tree vegetation. White fir succession will eventually dominate in some sites with continued fire exclusion. These sites have potential for an increase in snowbrush density if subjected to a hot fire. Serviceberry, wood rose, and snowberry will resprout following low and moderate intensity fires.

Soils

Soils are greater than 40 inches deep and are formed in ancient volcanic mudflow sediments. The soils are classified as loamy-skeletal, mixed, frigid, cumolic Ultic Haploxerolls. Available water holding capacity is about 2 inches in the top 20 inches of soil.

Productivity and Management

Regeneration potential for natural regeneration or planted tree seedlings is normally moderate to high. Plantability for tree seedlings will be difficult when the rock content in the soil is high. Clearcut or group-selected sites in this type that are planted to ponderosa or Jeffrey pine will eventually exhibit naturally regenerating white fir.

SERIES AND TYPE DESCRIPTIONS

WASHOE PINE SERIES

Washoe pine is a rare conifer that grows at high elevations (usually over 6500 feet) on the western edge of the Great Basin. This conifer is a close relative of ponderosa pine, and is also shade-intolerant. Washoe pine was first described as a species in 1945 (Griffin 1972). Washoe pine is probably not of hybrid origin, but most likely originated as a Pleistocene derivative of the North Plateau race of ponderosa pine which now occupies the interior Pacific Northwest (Critchfield 1984).

The largest known populations are on Mount Rose, near Reno, Nevada, and in the South Warner Mountains, Modoc National Forest.

Washoe pine is often seral to more shade-tolerant species such as white fir, especially on northerly aspects. The frigid and cryic soils, high elevations, and relatively high precipitation favor shade-tolerant whitewood species such as white fir over pine species. Washoe pine stands have been maintained in the past by periodic underburns and/or harsh topographic site conditions that discourage white fir regeneration and survival.

Washoe pine can express itself as a long-term dominant when site conditions are so harsh and exposed that shade-tolerant species cannot survive. One such site is the windswept, craggy, frigid summit of Bald Mountain, north Warner Mountains, CA. This site appears to have endured lightning strikes many times, which has also helped maintain the open pine structure. See the association description of Washoe/Pinemat Manzanita for more information.

WASHOE/PINEMAT MANZANITA
PIWA/ARNE2

CPOSMP11

Vegetation Summary Table
(Sample Size: 2)

		Cons	Cov
Tree Overstory Layer			
PIWAT	Washoe pine, overstory	100	13
PICOM	Lodgepole pine, midstory	100	2
PIMOM	W. white pine, midstory	50	15
PIWAM	Washoe pine, midstory	50	1
Tree Understory Layer			
PIMO3	Western white pine	50	5
PICO1	Lodgepole pine	50	2
PIWA	Washoe pine	50	1
Shrubs			
ARNE2	Pinemat manzanita	100	35
ERI11	Buckwheat	50	1
PREM	Bitter cherry	50	1
Herbs			
PHDI4	Spreading phlox	100	3
CAAP	Applegate's paintbrush	100	1
PESE3	Pine lousewort	100	1
CAUM	Pussypaws	100	1
ARAC1	Needleleaf sandwort	100	1
Grasses & Sedges			
STOC1	Western needlegrass	100	2
SIHY	Squirreltail	100	2
PONE1	Wheeler bluegrass	100	1
CARO1	Ross' sedge	50	2

Environment

Elev: 7730 (7720-7740)
Aspect: Southfacing
Slope: 13 (11-15)

Landform: Mountaintops and ridges, Warner Mountains.

R5 Site Class: 5 (5-5)

Special: White fir , lodgepole, and western white pine are associates in unburned sites.

Landscape Ecology and Environment

This minor and unique plant association was sampled along the spine of the north Warner Mountains, Modoc National Forest. One site where the type is especially noticeable is on the summit of Bald Mountain. The peak of the mountain is high elevation, exposed, and subject to tree-deforming winds.

Vegetation

The overstory at present is an assemblage of very old, wind-sheared washoe pine, with a few lodgepole and western white pine trees scattered throughout the understory. Regenerating species include washoe pine, lodgepole pine, and western white pine. The shrub understory is a relatively dense mat of pinemat manzanita.

Fire Ecology

The sites at Bald Mountain show evidence of recent underburning, probably in the last 30 to 40 years, and white fir regeneration is not yet evident. Less recently burned stands nearby have prominent white fir regeneration. All of the large washoe pine in the type plots had fire scars from past underburns. Natural fire frequency in this type may be relatively high because of the site's susceptibility to lightning strikes.

Soils

Soils are coarse sandy loams formed from intrusive rhyolitic obsidian, and are classified as loamy-skeletal, mixed, Typic Cryoborolls.

Productivity and Management

The type location is noncommercial for timber production. Unburned stands on less severe sites nearby exhibit shade-tolerant tree succession, and thinning from below or underburning may be desirable if a landscape goal is to maintain and regenerate washoe pine. This plant association is unique and picturesque, and values for wildlife, biodiversity, and scenery are high.

WASHOE-WHITE FIR/SNOWBERRY/STARWORT
PIWA-ABCO/SYVA/STJA **CPOSSY11**

Vegetation Summary Table
(Sample Size: 7)

		Cons	Cov
Tree Overstory Layer			
PIWAT	Washoe pine, overstory	100	46
PIWAM	Washoe pine, midstory	100	16
ABCOM	White fir, midstory	43	7
PICOM	Lodgepole pine, midstory	29	12
ABCOT	White fir, overstory	14	15
Tree Understory Layer			
PIWA	Washoe pine	50	1
Shrubs			
SYVA	Mountain snowberry	100	1
HABL	Bloomer goldenbush	43	1
ARTRV	Mountain big sagebrush	29	2
Herbs			
STJA	Sticky starwort	100	1
SEINM	Tower butterweed	86	1
LANE	Sierra nevada pea	71	2
MINU1	Nodding microseris	57	1
OSCH	Mountain sweetcicily	57	1
LUCA2	Spurred lupine	57	1
PEGR3	Slender penstemon	43	1
WYMO	Mountain mule ears	43	1
NEPAA	Small flowered nemophila	43	1
Grasses & Sedges			
CARO1	Ross' sedge	86	2
PONE1	Wheeler bluegrass	86	2
SIHY	Squirreltail	86	2
BROR1	Orcutt brome	71	2
STOC1	Western needlegrass	57	1

Environment

Elev: 7154 (6840-7580)
Aspect: Southfacing
Slope: 13 (1-27)

Landform: Upper, middle, lower 1/3 slopes.

R5 Site Class: 3 (2-4)

Special Northfacing slopes have higher cover levels of white fir.

Landscape Ecology and Environment

This plant association was sampled on the south end of the Warner Mountains, Modoc National Forest. Slopes range from nearly flat to 30 percent. Aspects for the sites still clearly pine-dominated tend to be southerly. Washoe pine is an "uncommon" (Hickman, ed 1993) species that occurs in small stands in the high-elevation western Great Basin mountains of northeastern California and western Nevada. The south Warner Mountains contain the most extensive stands.

Vegetation

This type is dominated at present by washoe pine. Washoe pine regeneration is variable. Most stands have at least some white fir regeneration. Other tree species that may be present include lodgepole pine, western white pine, and occasionally trembling aspen. Typical shrub and herbaceous species include mountain snowberry, sticky starwort, wheeler bluegrass, and tower butterweed.

Fire Ecology

These high elevation stands developed with periodic underburning that probably burned through areas in a mosaic pattern, allowing fire-susceptible species such as white fir to reach great size and age in many sites. White fire and lodgepole pine are therefore part of the biological potential for these stands. Most of the pines in the sample plots have evidence of past underburns in the form of butt scars and bark charring. With fire exclusion and overstory pine logging, these stands are progressing rapidly toward white fir domination.

Soils

Soils are mainly deep over well weathered hard fractured volcanic bedrock. Soils are in the Smarts, Gallatin, or Behanin families. Soil taxa are mixed, mesic and frigid Cryoborolls and Argixerolls. Available water holding capacity in the top 20 inches of soil ranges from 2 to 3 inches.

Productivity and Management

Regeneration potential will normally be high due to the relatively high available water holding capacity, high precipitation, and the lower evapotranspiration demands on these sites. Frigid soil temperatures, cold air ponding, and the short growing season affect the choice of reforestation species. Washoe pine, particularly the older, larger specimens, are an important component of structural and species diversity in this plant community. The community was maintained as a pine-dominant entity before fire suppression became a policy. Logging practices have strongly favored shade-tolerant successional whitewood conifer species while removing the large pine trees. Overstory removal by itself does not appear to provide for successful regeneration of washoe pine. The combination of logging practices and fire exclusion is contributing to this community's rapid advancement toward white fir dominance. This type is important habitat for many wildlife species, including great gray owl and goshawk.

GLOSSARY

LITERATURE CITED

GLOSSARY

Alluvium - A soil that has been deposited by water transport.

Ash (volcanic) - Fine pyroclastic material under 4.0 mm fragment diameter, usually produced by explosive, aerial ejection of pyroclastic particles from a volcanic vent.

Climax community - The potential natural community that appears to be self-perpetuating (existing species are reproducing) in the absence of disturbance and there is no concrete evidence that it is followed by a different subsequent community. See Potential Natural Community; **States and Transitions.**

Climax vegetation - The pattern or complex of climax communities in a landscape corresponding to the pattern of environmental gradients or habitats. **See States and Transitions.**

Colluvium - Unconsolidated earth material deposited on or at the base of slopes by direct gravitational action and local unconcentrated runoff.

Constancy - The percentage of plots within a type that contain the species. A constancy of 75% means that the species was present in 75% of the plots used to describe the type.

Canopy Cover - The area of ground included in a vertical projection of individual plant canopies.

Depauperate - A stand with sparse ground covering vegetation due to (1) tree overstory density precluding sufficient light for understory plant growth, or (2) a deep restricted litter or duff layer, or (3) a combination of limiting site factors.

Disclimax - A type of climax community which is maintained by either continuous or intermittent disturbance (i.e., grazing, burning, logging) to a severity that the natural climax community is altered. **See States and Transitions.**

Dominant - A plant or group of plants which by their collective size, mass, or number exert the most influence on other components of the ecosystem. Used also to describe species with the greatest canopy cover on a site.

Ecologic Equivalents - Plants having very similar environmental requirements.

Forb - An herbaceous plant other than a sedge, grass, or other graminoid plant.

Graminoid - A grass or grass-like plant.

Habitat Type - An aggregation of all land areas capable of supporting similar plant communities at climax. **See States and Transitions.**

Indicator Species - A species which is sensitive to important environmental features of a site such that its constancy or abundance reflect significant changes in environmental factors.

Plant Association - A unit of vegetation classification based on the projected potential natural vegetation or climax community type. **See States and Transitions.**

Plant Community - A general term for an assemblage of plants living together and interacting among themselves in a specific location; no particular ecological status is implied.

Plant Community Type - An aggregation of all plant communities with similar structure and floristic composition. A unit of vegetation within a classification with no particular successional status implied.

Potential Natural Community (PNC)- The biotic community that one presumes would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. PNC's have also been called plant associations, habitat types, and range sites. (FSM 2060) **See States and Transitions.**

Residual Soils - A soil that has developed in place from the local geologic formation. Usually residual soils have been formed from weathering and have not been significantly transported from the formative location.

Savanna - A type of vegetation in which tall, widely spaced plants such as trees are scattered over land otherwise covered with lower-growing plants.

Seral - A stage of temporary communities in a successional sequence. Involves species replacement, and therefore not the same as *stand development stages.* **See States and Transitions.**

Series - A vegetative series is an aggregation of taxonomically related plant associations which take the name of the (climatic) climax species that dominate (or have the potential to dominate) the principal vegetative layer in a time frame appropriate to the vegetative or taxonomic group under consideration.

Stand - Vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, structure and condition as to be distinguished from the vegetation on adjoining areas.

Stand development stages - Refers to stages of development of a single species, or life form; i.e., seedling, sapling, pole, mature, old growth stages. Often erroneously referred to as *seral stages.* Most often applied in usage to tree stands, although the concept also applies to other kinds of herbaceous and shrub vegetation.

States and Transitions - A model of community dynamics that acknowledges the

existence and development of, and linkages between, multiple steady states of vegetation and associated site components in response to different kinds and levels of disturbance. "Disturbance", including the disturbance of "no disturbance", is assumed to be operating over time in any environmental setting. This model includes, in part, the concept of "Potential Natural Community", which is but one possible state within the model among many potential stable or unstable states. This concept is especially useful in arid communities that can remain in a "disclimax" state more or less permanently, (i.e., with no additional perturbations, progress towards "climax" is not apparent); and in environments that evolved with periodic fire, such as the Eastside Pine communities and associations. The model acknowledges and attempts to display the complex nonlinearity of plant successional states. The concept is useful for managers because it displays multiple possibilities for stand states and dynamics resulting from disturbances such as low intensity fire, stand replacing fire, drought, fire exclusion, etc.

Subseries - A vegetative subseries is an aggregation of taxonomically related plant associations within a series that takes the name of that series followed by related species that are dominant, or have indicator value across multiple plant associations.

Succession - The unidirectional change in species composition and/or site complexity resulting from the replacement of one community with another toward some stable end point. This may be progressive from early seral stage toward climax or retrogressive from late seral stages toward very early seral stages or disclimax. **See States and Transitions**

References: Johnson et al (1992); Hall (1993); E.L. Smith (1988); Sugihara (1992); Westoby et al (1989); National Research Council (1994); FSM 2060.

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APPENDIX A
SPECIES LIST

ABCO	Abies concolor	White fir	PINACEAE
ACMI	Achillea millefolium	Yarrow	ASTERACEAE
AGEL2	Agoseris elata	Tall dandelion	ASTERACEAE
AGEX1	Agrostis exarata	Spike redtop	POACEAE
AGGL	Agoseris glauca	Pale dandelion	ASTERACEAE
AGGLL	Agoseris glauca laciniata	Pale dandelion	ASTERACEAE
AGGR1	Agoseris grandiflora	Grand mountain dandel	ASTERACEAE
AGHE	Agoseris heterophylla	Annual mountain dande	ASTERACEAE
AGPA3	Agastache parvifolia	Small-leaved horsemin	LAMIACEAE
AGRE2	Agoseris retrorsa	Spearleaf mountain da	ASTERACEAE
AGSP	Agropyron spicatum	Bluebunch wheatgrass	POACEAE
AGSU	Agropyron subsecundum	Slender wheatgrass	POACEAE
AGTR1	Agropyron trachycaulum	Slender wheatgrass	POACEAE
AGUR	Agastache urticifolia	Nettle-leaved horsemi	LAMIACEAE
ALAT	Allium atrorubens	Dark red onion	AMARYLLIDACEAE
ALCA2	Allium campanulatum	Sierra onion	AMARYLLIDACEAE
AMPA2	Amelanchier pallida	Western serviceberry	ROSACEAE
ANAR4	Antennaria argentea	Silvery pussytoes	ASTERACEAE
ANDI	Antennaria dimorpha	Low pussytoes	ASTERACEAE
ANGE1	Angelica genuflexa	Kneeling angelica	APIACEAE
ANGE2	Antennaria geyeri	Geyer's pussytoes	ASTERACEAE
ANLU2	Antennaria luzuloides	Silvery-brown pussyto	ASTERACEAE
ANRO	Antennaria rosea	Rosy everlasting	ASTERACEAE
ANT10	Antennaria sp., semiwoody	Pussytoes	ASTERACEAE
ANT4	Antennaria sp., herbaceous	Pussytoes	ASTERACEAE
APPU	Apocynum pumilum	Mountain hemp	APOCYNACEAE
AQFO	Aquilegia formosa	Crimson columbine	RANUNCULACEAE
ARA2	Arabis sp., herbaceous	Rock cress	BRASSICACEAE
ARA3	Arabis sp., herbaceous	Rock cress	BRASSICACEAE
ARAC1	Arenaria aculeata	Needleleaf sandwort	CARYOPHYLLACEAE
ARCO3	Arnica cordifolia	Heart-leaved arnica	ASTERACEAE
ARCO5	Arenaria congesta	Ballheaded sandwort	CARYOPHYLLACEAE
ARDI5	Arabis divaricarpa	Spreading rock cress	BRASSICACEAE
ARDO3	Artemisia douglasiana	Douglas' mugwort	ASTERACEAE
ARDR2	Arabis drummondii	Drummund's rock cress	BRASSICACEAE
ARGL2	Arabis glabra	Tower mustard	BRASSICACEAE
ARHOR	Arabis holboellii retrofract	Holboell's rock cress	BRASSICACEAE
ARHOR	Arabis holboellii retrofract	Holboell's rock cress	ERICACEAE
ARKIG	Arenaria kingii glabrescens	King's sandwort	CARYOPHYLLACEAE
ARLE	Arabis lemmonii	Lemmon's rock cress	BRASSICACEAE
ARLI	Arabis lignifera	Woody rock cress	BRASSICACEAE
ARLUI	Artemisia ludoviciana inc.	Western mugwort	ASTERACEAE
ARMI2	Arabis microphylla	Small-leaved rock cre	BRASSICACEAE
ARNE2	Arctostaphylos nevadensis	Pinemat manzanita	ERICACEAE
ARPA9	Arctostaphylos patula	Greenleaf manzanita	ERICACEAE
ARPL	Arabis platysperma	Pioneer rock cress	BRASSICACEAE
ARPU4	Arabis pulchra	Beautiful rock cress	BRASSICACEAE
ARRE1	Arabis rectissima	Bristly-leaved rock c	BRASSICACEAE
ARSP2	Arabis sparsiflora	Sicklepod rock cress	BRASSICACEAE
ARTRT	Artemisia tridentata trident	Basin big sagebrush	ASTERACEAE
ARTRV	Artemisia tridentata vaseyan	Mountain big sagebrus	ASTERACEAE
ASAD	Aster adscendens	Long-leaved aster	ASTERACEAE
ASCH	Aster chilensis	Hall's aster	ASTERACEAE

APPENDIX A
SPECIES LIST

ASCO1	Asclepias cordifolia	Purple milkweed	ASCLEPIADACEAE
ASFI	Astragalus filipes	Thread-leaved locowee	FABACEAE
ASOR	Aster oregonensis	Oregon aster	ASTERACEAE
ASPU2	Astragalus purshii	Pursh's locoweed	FABACEAE
AST5	Astragalus sp., herbaceous	Locoweed	FABACEAE
ASWH	Astragalus whitneyi	Whitney's locoweed	FABACEAE
BAHO	Balsamorhiza hookeri	Hooker's balsamroot	ASTERACEAE
BASA1	Balsamorhiza sagittata	Arrowleaf balsamroot	ASTERACEAE
BERE	Berberis repens	Oregongrape	BERBERIDACEAE
BLSCL	Blepharipappus scaber laevis	Rough eyelash	ASTERACEAE
BRIN1	Bromus inermis	Smooth brome	POACEAE
BRJA	Bromus japonicus	Japanese chess	POACEAE
BRMA3	Bromus marginatus	Mountain brome	POACEAE
BRO4	Brodiaea sp., herbaceous per	Brodiaea	AMARYLLIDACEAE
BROR1	Bromus orcuttianus	Orcutt brome	POACEAE
BRTE	Bromus tectorum,	Cheatgrass	POACEAE
CAAP	Castilleja applegatei	Applegate's paintbrus	SCROPHULARIACEAE
CAAR3	Castilleja arachnoidea	Cobwebby paintbrush	SCROPHULARIACEAE
CABR2	Carex brainerdii	Brainerd's sedge	CYPERACEAE
CABR5	Carex brevipes	Short sedge	CYPERACEAE
CADE3	Calocedrus decurrens	Incensecedar	CUPRESSACEAE
CAFE2	Carex feta	Green-sheathed sedge	CYPERACEAE
CAIN2	Carex inops	Long-stoloned sedge	CYPERACEAE
CAJE	Carex jepsonii	Jepson's sedge	CYPERACEAE
CAL5	Calochortus sp.	Mariposa lily	LILIACEAE
CALE6	Calochortus leichtlinii	Smokey mariposa	LILIACEAE
CAMA5	Calochortus macrocarpus	Sagebrush mariposa tu	LILIACEAE
CAMU1	Carex multicaulis	Manystem sedge	CYPERACEAE
CAR1	Carex sp. perennial	Sedge	CYPERACEAE
CARO1	Carex rossii	Ross' sedge	CYPERACEAE
CAS1	Castilleja sp.	Paintbrush	SCROPHULARIACEAE
CATO	Calochortus tolmiei	Tolmie pussy ears	LILIACEAE
CAUM2	Calyptridium umbellatum	Pussy paws	PORTULACACEAE
CEBE2	Cercocarpus betuloides	Birchleaf mountainmah	ROSACEAE
CECO2	Ceanothus cordulatus	Mountain whitethorn	RHAMNACEAE
CECU2	Ceanothus cuneatus	Wedgeleaf ceanothus	RHAMNACEAE
CEFL2	Ceanothus flexilis x cecu2 &	Ceanothus hybrid	RHAMNACEAE
CEIN3	Ceanothus integerrimus	Deerbrush	RHAMNACEAE
CELE3	Cercocarpus ledifolius	Curlleaf mountain mah	ROSACEAE
CEOC	Cercis occidentalis	California redbud	FABACEAE
CEPR	Ceanothus prostratus	Mahala mat	RHAMNACEAE
CEVE3	Ceanothus velutinus	Snowbrush	RHAMNACEAE
CEVI	Cerastium viscosum	Mouseear chickweed	CARYOPHYLLACEAE
CHBR3	Chrysopsis breweri	Brewer's goldenaster	ASTERACEAE
CHDO1	Chaenactis douglasii	Dusty maiden	ASTERACEAE
CHDOR	Chaenactis douglasii rubrica	Dusty maiden	ASTERACEAE
CHME2	Chimaphila menziesii	Pipsissewa	PYROLACEAE
CHMI	Chamaebatiaria millefolium	Desertsweet	ROSACEAE
CHNA2	Chrysothamnus nauseosus	Rubber rabbitbrush	ASTERACEAE
CHPA9	Chrysothamnus parryi	Parry rabbitbrush	ASTERACEAE
CHSE2	Chrysolepis sempervirens	Bush chinquapin	FAGACEAE
CHUMO	Chimaphila umbellata occ	Prince's pine	PYROLACEAE
CHVI3	Chrysopsis villosa	Hairy goldenaster	ASTERACEAE

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CIAN1	Cirsium andersonii	Anderson thistle	ASTERACEAE
CIDR	Cirsium drummondii	Drummond's thistle	ASTERACEAE
CIPA	Circium pastoris	Red thistle	ASTERACEAE
CIR2	Cirsium sp.	Thistle	ASTERACEAE
CIRE	Cirsium remotifolium	Western thistle	ASTERACEAE
CLA2	Clarkia sp.	Farewelltospring	ONAGRACEAE
CLRH	Clarkia rhomboidea	Forest clarkia	ONAGRACEAE
COGR3	Collomia grandiflora	Mountain collomia	POLEMONIACEAE
COL4	Collinsia sp.	Chinese houses	SCROPHULARIACEAE
COL5	Collomia sp.	Collomia	POLEMONIACEAE
COLI2	Collomia linearis	Slenderleaf collomia	POLEMONIACEAE
COMA4	Corallorhiza maculata	Spotted coralroot	ORCHIDACEAE
CON6	Convolvulus sp.	Morningglory	CONVOLVULACEAE
COPA2	Collinsia parviflora	Maiden blue-eyed Mary	SCROPHULARIACEAE
COPO	Convolvulus polymorphus	Modoc morningglory	CONVOLVULACEAE
COTE2	Cordylanthus tenuis	Slender bird's beak	SCROPHULARIACEAE
COTI2	Collomia tinctoria	Staining collomia	POLEMONIACEAE
CRAC2	Crepis acuminata	Hawksbeard	ASTERACEAE
CRAF	Cryptantha affinis	Cryptantha	BORAGINACEAE
CRAM	Cryptantha ambigua	Cryptantha	BORAGINACEAE
CRE3	Crepis sp.	Hawksbeard	ASTERACEAE
CRMO2	Crepis monticola	Mountain hawksbeard	ASTERACEAE
CRMOS	Crepis modocensis sub.	Modoc hawksbeard	ASTERACEAE
CROC	Crepis occidentalis	Western hawksbeard	ASTERACEAE
CRY2	Cryptantha sp.	Cryptantha	BORAGINACEAE
CYOC	Cynoglossum occidentale	Houndstongue	BORAGINACEAE
DAUN	Danthonia unispicata	Onespike oatgrass	POACEAE
DEAN	Delphinium andersonii	Anderson's delphinium	RANUNCULACEAE
DEL2	Delphinium sp.	Larkspur	RANUNCULACEAE
DENU1	Delphinium nudicaule	Red larkspur	RANUNCULACEAE
DERI2	Descurainia richardsonii	Mountain tansy mustar	BRASSICACEAE
DRVE	Draba verna	Whitlowgrass	BRASSICACEAE
ELCA2	Elymus caputmedusae	Medusahead	POACEAE
ELCI	Elymus cinereus	Great basin wild rye	POACEAE
ELGL	Elymus glaucus	Blue wild rye	POACEAE
EPAN2	Epilobium angustifolium	Red fireweed	ONAGRACEAE
EPI3	Epilobium sp.	Fireweed	ONAGRACEAE
EPMI	Epilobium minutum	Slender annual firewe	ONAGRACEAE
EPPA	Epilobium paniculatum	Annual fireweed	ONAGRACEAE
EREAP	Erigeron eatonii plantagineu	Eaton's daisy	ASTERACEAE
ERFI2	Erigeron filifolius	Thread-leaved daisy	ASTERACEAE
ERI10	Eriogonum sp.	Buckwheat	POLYGONACEAE
ERI11	Eriogonum sp.	Buckwheat	POLYGONACEAE
ERI20	Eriogonum sp.	Buckwheat	POLYGONACEAE
ERI6	Erigeron sp.	Wild daisy	ASTERACEAE
ERIN1	Eriogonum inerme	Unarmed buckwheat	POLYGONACEAE
ERIN2	Erigeron inornatus	California rayless da	ASTERACEAE
ERLA6	Eriophyllum lanatum	Common woollysunflowe	ASTERACEAE
ERMA3	Eriogonum marifolium	Marum-leaved buckwhea	POLYGONACEAE
ERNU3	Eriogonum nudum	Naked buckwheat	POLYGONACEAE
ERPE3	Erysimum perenne	Sierra wallflower	BRASSICACEAE
ERPRA	Eriogonum proliferum ans.	Proliferous buckwheat	POLYGONACEAE
ERSP2	Eriogonum spergulinum	Spurry buckwheat	POLYGONACEAE

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ERSP4	Eriogonum sphaerocephalum	Roundheaded buckwheat	POLYGONACEAE
ERUMC	Eriogonum umbellatum cov.	Coleville buckwheat	POLYGONACEAE
ERUMU	Eriogonum umbellatum umb.	Sulfur buckwheat	POLYGONACEAE
EUOC1	Eupatorium occidentale	Western daisy	ASTERACEAE
EUP4	Euphorbia sp.	Spurge	EUPHORBIACEAE
FEID	Festuca idahoensis	Idaho fescue	POACEAE
FEOC1	Festuca occidentalis	Western fescue	POACEAE
FES3	Festuca sp. longevity unknow	Fescue	POACEAE
FRAL1	Frasera albicaulis	Whitestem frasera	GENTIANACEAE
FRAT	Fritillaria atropurpurea	Spotted mountain bell	LILIACEAE
FRCA1	Fragaria californica	Wood strawberry	ROSACEAE
FRPI	Fritillaria pinetorum	Pine bells	LILIACEAE
FRPL1	Fragaria platypetala	Scarlet strawberry	ROSACEAE
FRSP	Frasera speciosa	Monument plant	GENTIANACEAE
GAAP	Galium aparine	Goosegrass	RUBIACEAE
GABO1	Galium bolanderi	Bolander galium	RUBIACEAE
GAHE	Gayophytum helleri	Heller's groundsmoke	ONAGRACEAE
GAL3	Galium sp.	Galium , bedstraw	RUBIACEAE
GANU1	Gayophytum nuttallii	Nuttall's groundsmoke	ONAGRACEAE
GARA2	Gayophytum ramosissimum	Much-branched grounds	ONAGRACEAE
GECI	Geum ciliatum	Prairie smoke	ROSACEAE
GENE2	Geranium nervosum	Teton geranium	GERANIACEAE
GEOR2	Geranium oreganum	Oregon geranium	GERANIACEAE
GICA4	Gilia capitata	Blue field gilia	POLEMONIACEAE
GOOB	Goodyera oblongifolia	Rattlesnake plantain	ORCHIDACEAE
HABL	Haplopappus bloomeri	Bloomer goldenbush	ASTERACEAE
HACA1	Hackelia californica	California stickseed	BORAGINACEAE
HAGR2	Haplopappus greenei	Greene's goldenweed	ASTERACEAE
HAHIL	Haplopappus hirtus lanulosus	Sticky goldenweed	ASTERACEAE
HAUN1	Habenaria unalascensis	Rein orchid	ORCHIDACEAE
HECAN	Helianthella californica nev	Sierra helianthella	ASTERACEAE
HEOV	Heuchera ovalifolia	Oval-leaved heuchera	SAXIFRAGACEAE
HIAL	Hieracium albiflorum	Whiteflower hawkweed	ASTERACEAE
HIBO	Hieracium bolanderi	Bolander hawkweed	ASTERACEAE
HIE2	Hieracium sp.	Hawkweed	ASTERACEAE
HIGR1	Hieracium gracile	Slender hawkweed	ASTERACEAE
HIGR2	Hieracium greenei	Greene hawkweed	ASTERACEAE
HIHO	Hieracium horridum	Shaggy hawkweed	ASTERACEAE
HOFU	Horkelia fusca	Dusky horkelia	ROSACEAE
HOTR1	Horkelia tridentata	Threetooth horkelia	ROSACEAE
HYCAA	Hydrophyllum capitatum al.	Dwarf waterleaf	HYDROPHYLLACEAE
HYOC	Hydrophyllum occidentale	California waterleaf	HYDROPHYLLACEAE
IPAG	Ipomopsis aggregata	Scarlet gilia	POLEMONIACEAE
IRI	Iris sp.	Iris	IRIDACEAE
IRTE	Iris tenuissima	Iris	IRIDACEAE
JUOCA	Juniperus occidentalis austr	Sierra juniper	CUPRESSACEAE
JUOCO	Juniperus occidentalis occid	Western	CUPRESSACEAE
KEGA	Kelloggia galioides	Kelloggia	RUBIACEAE
KOCR	Koeleria cristata	Junegrass	POACEAE
LAC1	Lactuca sp.	Wild lettuce	ASTERACEAE
LALA2	Lathyrus lanszwertii	Nevada pea	FABACEAE
LANE	Lathyrus nevadensis	Sierra nevada pea	FABACEAE
LARA	Lagophylla ramosissima	Common hareleaf	ASTERACEAE

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LASE1	Lactuca serriola	Prickly lettuce	ASTERACEAE
LEP2	Lepidium sp.	Peppergrass	BRASSICACEAE
LEPU	Leptodactylon pungens	Granite gilia	POLEMONIACEAE
LIBR3	Lithophragma brevilobum	Woodland star	SAXIFRAGACEAE
LIBU	Lithophragma bulbiferum	Rock star	SAXIFRAGACEAE
LICA5	Lithospermum californicum	Shasta puccoon	BORAGINACEAE
LICI	Linanthus ciliatus	Whisker linanthus	POLEMONIACEAE
LIG	Ligusticum sp.	Lovage	APIACEAE
LIHA	Linanthus harknessii	Harkness linanthus	POLEMONIACEAE
LIMI	Linum micranthum	Common dwarf flax	LINACEAE
LIMO2	Linanthus montanus	Mustang clover	POLEMONIACEAE
LIPEL	Linum perenne lewisii	Western blue flax	LINACEAE
LIRU3	Lithospermum ruderale	Columbia puccoon	BORAGINACEAE
LIWA	Lilium washingtonianum	Washington lily	LILIACEAE
LODI	Lomatium dissectum	Fern-leaved lomatium	APIACEAE
LOIN3	Lonicera interrupta	Chaparral honeysuckle	CAPRIFOLIACEAE
LOM1	Lomatium sp.	Lomatium	APIACEAE
LOMI	Lotus micranthus	Smallflower lotus	FABACEAE
LON	Lonicera sp.	Honeysuckle	CAPRIFOLIACEAE
LONE1	Lomatium nevadense	Nevada lomatium	APIACEAE
LONU1	Lomatium nudicaule	Pestle parsnip	APIACEAE
LOPU2	Lotus purshianus	Spanish clover	FABACEAE
LOTR2	Lomatium triternatum	Lomatium	APIACEAE
LUAL1	Lupinus albicaulis	Sicklekeel lupine	FABACEAE
LUBR2	Lupinus breweri	Brewer's lupine	FABACEAE
LUCA2	Lupinus caudatus	Spurred lupine	FABACEAE
LULO1	Lupinus lobbii	Lobb's lupine	FABACEAE
LUP3	Lupinus sp.	Lupine	FABACEAE
LUP4	Lupinus sp.	Perennial lupine	FABACEAE
LUSEU	Lupinus sellulus ursinus	Arid-soil lupine	FABACEAE
LYSP	Lygodesmia spinosa	Rush-pink	ASTERACEAE
MACA1	Machaeranthera canescens	Hoaryaster	ASTERACEAE
MAEX1	Madia exigua	Little tarweed	ASTERACEAE
MAFL	Malacothrix floccifera	Wooly soft-haired Dai	ASTERACEAE
MAGL1	Madia glomerata	Small tarweed	ASTERACEAE
MAMI1	Madia minima	Hemizonella	ASTERACEAE
MASH	Machaeranthera shastensis	Shasta wooly daisy	ASTERACEAE
MEAR1	Melica aristata	Awned melic	POACEAE
MEBUB	Melica bulbosa bulbosa	Bulbous melic	POACEAE
MECO1	Mentzelia congesta	Tarweed	LOASACEAE
MEDI	Mentzelia dispersa	Nada stickleaf	LOASACEAE
MEFU	Melica fugax	Little oniongrass	POACEAE
MEL1	Melica sp. perennial	Melic, oniongrass	POACEAE
MEL4	Melissa sp.	herbaceous pere	LAMIACEAE
MEN2	Mentzelia sp.	Blazing star	LOASACEAE
MIGR1	Microsteris gracilis	Microsteris	POLEMONIACEAE
MILE1	Mimulus leptaleus	Least-flowered monkey	SCROPHULARIACEAE
MINU1	Microseris nutans	Perennial nodding mic	ASTERACEAE
MIWH2	Mimulus whitneyi	Whitney monkeyflower	SCROPHULARIACEAE
MOOD	Monardella odoratissima	Mountain monardella	LAMIACEAE
MOPE2	Montia perfoliata	Miners lettuce	PORTULACACEAE
MOSPE	Montia spathulata exigua	Linear montia	PORTULACACEAE
MUJO	Muhlenbergia jonesii	Jones's muhly	POACEAE

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NADI	Navarretia divaricata	Mountain navarretia	POLEMONIACEAE
NEPAA	Nemophila parviflora austina	Small flowered nemoph	HYDROPHYLLACEAE
ORIM	Orthocarpus imbricatus	Mountain orthocarpus	SCROPHULARIACEAE
OSCH	Osmorhiza chilensis	Mountain sweetcicely	APIACEAE
OSM	Osmorhiza sp.	Sweetcicely	APIACEAE
PABR	Paeonia brownii	Western peony	PAEONIACEAE
PAMY	Paxistima myrsinites	Oregon boxwood	CELASTRACEAE
PEBRG	Penstemon breviflorus glabri	Bush beardtongue	SCROPHULARIACEAE
PECI1	Penstemon cinereus	Ashy penstemon	SCROPHULARIACEAE
PEDEH	Penstemon deustus heter.	Hot rock penstemon	SCROPHULARIACEAE
PEGR3	Penstemon gracilentus	Slender penstemon	SCROPHULARIACEAE
PELA2	Penstemon laetus	Gay penstemon	SCROPHULARIACEAE
PELAS	Penstemon laetus sagittatus	Gay penstemon	SCROPHULARIACEAE
PELE	Penstemon lemmonii	Lemmon beardtongue	SCROPHULARIACEAE
PEN2	Penstemon sp.	Penstemon	SCROPHULARIACEAE
PESE3	Pedicularis semibarbata	Pine lousewort	SCROPHULARIACEAE
PESP1	Penstemon speciosus	Showy penstemon	SCROPHULARIACEAE
PHCH2	Phoenicaulis cheiranthoides	Dagger pod	BRASSICACEAE
PHDI4	Phlox diffusa	Spreading phlox	POLEMONIACEAE
PHHA	Phacelia hastata	Phacelia	HYDROPHYLLACEAE
PHHE1	Phacelia heterophylla	Phacelia	HYDROPHYLLACEAE
PHHU	Phacelia humilis	Low phacelia	HYDROPHYLLACEAE
PHMU2	Phacelia mutabilis	Changeable phacelia	HYDROPHYLLACEAE
PHSPO	Phlox speciosa occidentalis	Western showy phlox	POLEMONIACEAE
PIAL	Pinus albicaulis	Whitebark pine	PINACEAE
PIAT1	Pinus attenuata	Knobcone pine	PINACEAE
PICO1	Pinus contorta	Lodgepole pine	PINACEAE
PICOM	Pinus contorta	Midstory lodgepole pi	PINACEAE
PIJE	Pinus jeffreyi	Jeffrey pine	PINACEAE
PILA	Pinus lambertiana	Sugar pine	PINACEAE
PIMO3	Pinus monticola	Western white pine	PINACEAE
PIMOM	Pinus monticola	Midstory western whit	PINACEAE
PIPO	Pinus ponderosa	Ponderosa pine	PINACEAE
PIWA	Pinus washoensis	Washoe Pine	PINACEAE
PLMA2	Plectritis macrocera	Rotund plectritis	VALERIANACEAE
POAV	Polygonum aviculare	Common knotweed	POLYGONACEAE
POCA3	Poa canbyi	Canby bluegrass	POACEAE
POCO6	Polygala cornuta	Sierra milkwort	POLYGALACEAE
PODR	Potentilla drummondii	Drummond's cinquefoil	ROSACEAE
POFL2	Potentilla flabelliformis	Fanleaf cinquefoil	ROSACEAE
POGL2	Potentilla glandulosa	Common cinquefoil	ROSACEAE
POGLN	Potentilla glandulosa nevade	Nevada cinquefoil	ROSACEAE
POIN1	Poa incurva	Sandberg bluegrass	POACEAE
POL11	Polygonum sp.	Knotweed	POLYGONACEAE
PONE1	Poa nervosa	Wheeler bluegrass	POACEAE
PONE3	Polygonum newberryi	Newberry's knotweed	POLYGONACEAE
POPR1	Poa pratensis	Kentucky bluegrass	POACEAE
POSA3	Poa sandbergii	Sandberg bluegrass	POACEAE
POT3	Potentilla sp.	Cinquefoil	ROSACEAE
POT4	Potentilla sp.	Cinquefoil	ROSACEAE
POTR3	Populus tremuloides	Quaking aspen	SALICACEAE
PREM	Prunus emarginata	Bitter cherry	ROSACEAE
PRSU2	Prunus subcordata	Sierra plum	ROSACEAE

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PRVI	Prunus virginiana	Chokecherry	ROSACEAE
PSME	Pseudotsuga menziesii	Douglasfir	PINACEAE
PTAN	Pterospora andromedea	Pine drops	PYROLACEAE
PTAQL	Pteridium aquilinum lanugino	Bracken fern	PTERIDACEAE
PTAQP	Pteridium aquilinum pubescen	Bracken fern	PTERIDACEAE
PTTEC	Pteryxia terebinthina califo	Terebinth pteryxia	APIACEAE
PUTR	Purshia tridentata	Bitterbrush	ROSACEAE
PYPIA	Pyrola picta aphylla	Leafless pyrola	PYROLACEAE
PYPID	Pyrola picta dentata	Wintergreen	PYROLACEAE
PYPII	Pyrola picta integra	Wintergreen	PYROLACEAE
PYR	Pyrola sp.	Wintergreen	PYROLACEAE
QUKE	Quercus kelloggii	California black oak	FAGACEAE
QUVA	Quercus vaccinifolia	Huckleberry oak	FAGACEAE
QUWI	Quercus wislizenii	Interior live oak	FAGACEAE
RAN3	Ranunculus sp.	Buttercup	RANUNCULACEAE
RAOCE	Ranunculus occidentalis eise	Western buttercup	RANUNCULACEAE
RHRUM	Rhamnus rubra modocensis	Modoc coffeeberry	RHAMNACEAE
RHTRQ	Rhus trilobata quinata	Skunkbrush	ANACARDIACEAE
RIAU	Ribes aureum	Golden currant	SAXIFRAGACEAE
RIB	Ribes sp.	Gooseberry	SAXIFRAGACEAE
RICE	Ribes cereum	Wax current	SAXIFRAGACEAE
RIMO	Ribes montigenum	Alpine prickly curren	SAXIFRAGACEAE
RIRO	Ribes roezlii	Sierra gooseberry	SAXIFRAGACEAE
RIVE	Ribes velutinum	Plateau gooseberry	SAXIFRAGACEAE
RIVI3	Ribes viscosissimum	Sticky flowering curr	SAXIFRAGACEAE
ROWOU	Rosa woodsii ultramontana	Interior rose	ROSACEAE
RUB2	Rubus sp.	Blackberry	ROSACEAE
RUM2	Rumex sp.	Dock	POLYGONACEAE
RUPA2	Rubus parviflorus	Western thimbleberry	ROSACEAE
SACA4	Sambucus caerulea	Mountain blue elderbe	CAPRIFOLIACEAE
SASC	Salix scouleriana	Nuttall willow	SALICACEAE
SEAR	Senecio aronicoides	California butterweed	ASTERACEAE
SECA3	Senecio canus	Wooly butterweed	ASTERACEAE
SEINE	Senecio integerrimus exaltat	Tower butterweed	ASTERACEAE
SEINM	Senecio integerrimus major	Tower butterweed	ASTERACEAE
SEN2	Senecio sp.	Groundsel	ASTERACEAE
SEST1	Sedum stenopetalum	Narrow-petaled sedum	CRASSULACEAE
SIAL	Sisymbrium altissimum	Tumble mustard	BRASSICACEAE
SID4	Sidalcea sp.	Sidalcea	MALVACEAE
SID6	Sidalcea sp.	Sidalcea	MALVACEAE
SIDO1	Silene douglasii	Douglas' catchfly	CARYOPHYLLACEAE
SIGL	Sidalcea glaucescens	Waxy sidalcea	MALVACEAE
SIHY	Sitanion hystrix	Squirreltail	POACEAE
SIL2	Silene sp.	Silene,campion	CARYOPHYLLACEAE
SILE	Silene lemmonii	Lemmon campion	CARYOPHYLLACEAE
SIME	Silene menziesii	Menzie's catchfly	CARYOPHYLLACEAE
SIOC	Silene occidentalis	Western catchfly	CARYOPHYLLACEAE
SIOR1	Sidalcea oregana	Oregon catchfly	CARYOPHYLLACEAE
SMI1	Smilacina sp.	Solomon's seal	LILIACEAE
SMRA	Smilacina racemosa	Branched Solomon's se	LILIACEAE
SMRAG	Smilacina racemosa glabra	Branched Solomon's se	LILIACEAE
SMST	Smilacina stellata	Star Solomon's seal	LILIACEAE
SOCA2	Solidago californica	California goldenrod	ASTERACEAE

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SOMU	Solidago multiradiata	Northern goldenrod	ASTERACEAE
SOOL	Sonchus oleraceus	Common sow thistle	ASTERACEAE
STCO1	Stipa columbiana	Columbia stipa	POACEAE
STCO4	Streptanthus cordatus	Heart-leaved jewelflo	BRASSICACEAE
STE7	Stephanomeria sp.	Wirelettuce	ASTERACEAE
STEL1	Stipa elmeri	Elmer stipa	POACEAE
STI1	Stipa sp. perennial	Stipa, needlegrass	POACEAE
STJA	Stellaria jamesiana	Sticky starwort	CARYOPHYLLACEAE
STLA2	Stephanomeria lactucina	Large-flowered wirele	ASTERACEAE
STLE3	Stipa lettermanii	Letterman stipa	POACEAE
STOC1	Stipa occidentalis	Western stipa	POACEAE
STTH	Stipa thurberiana	Thurber stipa	POACEAE
STTO	Streptanthus tortuosus	Mountain jewelflower	BRASSICACEAE
SYAC	Symphoricarpos acutus	Spreading snowberry	CAPRIFOLIACEAE
SYVA	Symphoricarpos vaccinioides	Mountain snowberry	CAPRIFOLIACEAE
TAOF	Taraxacum officinale	Common dandelion	ASTERACEAE
TRCEC	Trisetum cernuum canescens	Tall trisetum	POACEAE
TRDU1	Tragopogon dubius	Yellow salsify	ASTERACEAE
TRIXA	Triteleia ixioides anilina	Golden triteleia	AMARYLLIDACEAE
TRLE	Trifolium lemmonii	Lemmon's clover	FABACEAE
TRLO	Trifolium longipes	Summer clover	FABACEAE
VETH	Verbascum thapsus	Common mullein	SCROPHULARIACEAE
VIAMO	Vicia americana oregana	American vetch	FABACEAE
VIBA	Viola bakeri	Baker violet	VIOLACEAE
VICA1	Vicia californica	California vetch	FABACEAE
VIO3	Viola sp.	Violet	VIOLACEAE
VIPRM	Viola praemorsa major	Astoria violet	VIOLACEAE
VIPU	Viola purpurea	Mountain violet	VIOLACEAE
VISH	Viola sheltonii	Shelton violet	VIOLACEAE
VUMI	Vulpia microstachys	Reflex annual fescue	POACEAE
WOOR	Woodsia oregana	Oregon woodsia	ASPIDIACEAE
WYMO	Wyethia mollis	Mountain mule ears	ASTERACEAE
ZIPA	Zigadenus paniculatus	Sandcorn	LILIACEAE

APPENDIX B.1

FIRE EFFECTS ON PONDEROSA AND JEFFREY PINE

Fire Effects on Ponderosa and Jeffrey Pines[1]

TREE AGE	LOW INTENSITY BURN (< 2' FLAME LENGTH)	MOD. INTENSITY BURN (2-4' FLAME LENGTH)	HIGH INTENSITY BURN (≥ 4' FLAME LENGTH)
AGE: 1 - 15			
NEGATIVE:	10% to 100% kill depending on age 50% Nitrogen loss to volitilization. Less sulphur (S), phosphorus(P) loss.	Stand destruction. Moderate to high nutrient loss	Stand destruction; increased erosion. Loss of 90% N; 60% S; 30% P. Hydrophobicity likely.
POSITIVE:	Release from shrubs from age 10; temporary increase in nutrient availablity.	N/A	N/A
AGE: 16 - 40			
NEGATIVE:	50% N loss to volitilization. Less S; P loss	15% mortality. Some nutrient loss. 5% basal scars.	Stand destruction. Nutrient loss as above.
POSITIVE:	Same as Age 1 - 15.	75% thinning, in prescription. Tree release. Increased short-term nutrient availablity.	N/A
AGE: 41 - 100			
NEGATIVE:	50% N loss to volitilization. Less S, P lost.	5% mortality; 1% basal scars. Moderate nutrient loss.	70% - 100% mortality. Loss of 90% N; 60% S; 30% P. Hydrophobicity likely.
POSITIVE:	Same as Age 1 - 15.	50% thinning, in prescription	N/A
AGE: > 101			
NEGATIVE:	50% N loss to volitilization. Less S, P lost.	1% morttality. Moderate nutrient loss.	50 - 100% kill. Hydrophobicity. Loss of 90% N; 60% S; 30% P.
POSITIVE:	Same as age 1 - 15.	"Release" from shrubs. Incr. short-term nutrient avail.	N/A

[1]Adapted from Webb, undated

LOW INTENSITY BURN: Most of the forest floor is intact and unburned; spotty black ash condition; most downed woody debris intact with small diameter debris charred.
MOD. INTENSITY BURN: Lower fermentation layer of forest floor is intact and mostly unburned; black ash conditions; most of the finer diameter downed woody material is destroyed while most or all of the medium and larger material is charred but intact.
HIGH INTENSITY BURN: All or most of the forest floor is destroyed; white ash conditions; only a few larger diameter downed logs remain.

APPENDIX B.2

GENERAL FIRE EFFECTS ON EASTSIDE SHRUBS AND HERBACEOUS VEGETATION

General fire effects on eastside shrubs and herbaceous vegetation[1]

RESOURCE	LOW INTENSITY BURN (< 2' FLAME LENGTH)	MOD. INTENSITY BURN (2-4' FLAME LENGTH)	HIGH INTENSITY BURN (≥ 4' FLAME LENGTH)
PP, JP W/OUT SHRUBS			
PRESCRIPTION TIME:	Spring or fall with good soil moisture.		
RESPONSE:			
1. Graminoids and forbs	quantity/quality: +10%	quantity: +25% quality: +15%	**NOT DESIREABLE**
PP, JP WITH MANZANITA AND/OR SNOWBRUSH			
PRESCRIPTION TIME:	Springor fall with good soil moisture.		
RESPONSE:			
1. Graminoids and forbs	quantity/quality: +10%	quantity/quality: +25%	**NOT DESIREABLE** Greenleaf manzanita and/or snowbrush can dominate these sites following high intensity burns.
2. Shrubs	quantity: +10% quality: +20%	quantity: +50% quality: +25%	
PP, JP WITH BITTERBRUSH			
PRESCRIPTION TIME:	Springor fall with good soil moisture. Spring best; after good bitterbrush seed year.		
RESPONSE:			
1. Graminoids and forbs	quantity/quality: +10%	quantity/quality: +25%	**NOT DESIREABLE** Greenleaf manzanita and/or snowbrush may dominate if dormant seed is present in the soil.
2. Bitterbrush	-10% quantity; some increase in quality. Slight increase in quality long -term	quantity, short term: -25% quantity/quality long term: +25% Bitterbrush seeding may be needed in some cases.	

[1]Adapted from Webb, undated

APPENDIX B.3

SPECIFIC FIRE EFFECTS:
EASTSIDE SHRUBS

Specific fire effects: Eastside shrubs[1]

ATTRIBUTE	AMPA2	ARPA9	ARTRV	BERE	CELE3	CEVE3	PRVI	PUTR	RHTRQ	RIBES	ROS	SASC
I. Vegetative Regeneration												
A. Resprouters												
1. Root crown	X	X				X	X	X(L)	X	X(L)	X	X
2. Rhizome or underground												
3. Aboveground stem						X(L)						
B. Fire Resistant (mature plants)						X(L)						
11. Seedling Regeneration												
A. Seed Dispersal												
1. Airborne dispersal												
a. Short viability			X		X(H)							
b. Long viability												
2. Animal, other dispersal												
a. Short viability	X			X	X		X	X	X		X	
b. Long viability												
III. Shade Tolerance												
A. Tolerant	X			X	X		X		X		X	
B. Intolerant		X	X			X		X		X		X
IV. Persistence Mode												
A. Invaders			X									X
B. Evaders		X				X				X		
C. Avoiders					X(L)			X(2)				
D. Resisters					X(L)							
E. Endurers	X			X			X	X	X		X	
V. Rowe Classification (see next page)	W	SI	DRT	VT	WTC	SI	VI	VI	VT	VI(L)	VT	DI

(L) = Low intensity fire; (H) = High intensity fire; (1) = Sprouting ecotype; (2) = Nonsprouting ecotype

[1]Adapted from Noste et al 1987.

ROWE FIRE RESPONSE CLASSIFICATION

I. Regeneration Method
- A. Mode of regeneration and reproduction
  1. Vegetative based (plant relies on surviving parts to regenerate)
     - a. **V** species: able to resprout if burned in the juvenile stage.
     - b. **W** species: able to resist fire in the adult stage and to continue extension growth after fire (although fire may kill juveniles)
  2. Disseminule base (plant relies on seed to reestablish)
     - a. **D** species: with highly dispersed seed.
     - b. **S** species: storing long-lived seed in the soil.
     - c. **C** species: storing seed in the canopy
  3. Competitive classification
     - a. **T** species: tolerants that can establish immediately after a fire and can persist indefinitely thereafter.
     - b. **R** species: tolerants that cannot establish immediately after disturbance but must wait until some additional requirement has been met (e.g., shade established)
     - c. **I** species: Intolerants that can only establish immediately after a fire. Rapid growth pioneers, they tend to die out without recurrent site disturbances.

II. Persistence Mode
- A. Seed based, reproducing primarily by dispersing seeds
  1. **Invaders**: rapidly spreading plants that establish early, with short-lived seed (**DI** species).
  2. **Evaders:** species with relatively long-lived seeds that are stored in the soil or canopy (**CI**, **SI**, and **ST** species).
  3. **Avoiders** shade-tolerant species that slowly reinvade burned area; late successional, often with symbiotic relationships and vertical extensions.
- B. Plant persists because of adaptation to direct fire
  1. **Resisters:** shade intolerant species whose adult stages can survive low severity fires (**WI** species).
  2. **Endurers:** resprouting species, shade-intolerant or tolerant, with shallow or deep-buried perennating buds (**VI** or **VT** species).

APPENDIX C

SUMMARY PRODUCTIVITY ESTIMATES BY TYPE

SUMMARY PRODUCTIVITY ESTIMATES BY TYPE

TYPE	QMD	SDI	%SDI NRM	AGE	BA	R-5 SITE CLSS	PROD INDX
PIJE-QUKE/RHTRQ	14	208	56	217	120	5	22
PIJE/ARTRV/FEID	22	199	54	378	123	3	37
PIJE/PUTR/WYMO	19	188	51	308	113	3	45
PIJE/PUTR-SYVA/POA	15	262	71	303	150	4	49
PIJE/PUTR-CELE3/STOC1	21	251	68	315	151	4	37
PIJE/CELE3	15	184	50	222	97	4	22
PIJE-ABCO/SYVA/PONE1	20	252	68	333	157	3	45
PIJE-ABCO/PONE1//GRANITE	16	271	73	261	160	4	35
PIPO/CELE3-PUTR/FEID	19	182	49	211	113	4	29
PIPO/PUTR/STOC1//PUMICE	21	178	48	265	112	4	39
PIPO/PUTR/FEID	20	218	59	247	138	4	49
PIPO/PUTR/BASA1	21	209	56	298	123	4	41
PIPO/PUTR-RICE/BROR1	21	160	43	154	100	2	142
PIPO/PUTR-PRUNUS/BROR1	22	208	56	223	133	3	67
PIPO/PUTR-PRUNUS/AGSP	16	173	47	208	103	3	40
PIPO/PUTR-CEVE3-ARPA9/BROR1	22	178	48	196	111	2	65
PIPO/ARTRV/FEID	23	208	56	390	129	3	41
PIPO/AMPA2-PRUNUS	20	270	73	261	168	3	63
PIPO/AMPA2-BERE/ARCO3	19	307	83	254	194	3	72
PIPO-QUKE/PUTR/STOC1	15	153	41	171	90	4	35
PIPO-CADE3/PUTR-AMPA2/BASA1	19	284	77	245	176	3	54
PIPO-ABCO-PICO1/AMPA2	12	446	121	128	253	1	173
PIPO-ABCO-QUKE/AMPA2	18	337	91	190	205	3	63
PIPO-ABCO/AMPA2-BERE	16	326	88	318	190	3	80
PIPO-ABCO/AMP2-CEVE3/BROR1	23	242	65	159	158	2	93
PIPO-ABCO/AMPA2/PYPID	18	283	76	294	179	3	53
PIPO-ABCO/CEVE3/STOC1	22	252	68	267	160	3	56
PIPO-ABCO/PUTR-ARPA9/STOC1	22	247	67	276	154	3	52
PIPO-ABCO/SYAC	15	275	74	272	173	3	51
PIWA/ARNE2	15	150	41	446	90	5	14
PIWA-ABCO/SYVA/STJA	25	331	90	391	221	3	71
YP/RHRUM/POSA3	17	226	61	251	136	5	26
YP/PUTR/FEID//GRANITE	28	171	46	303	114	4	45
YP/PUTR/FEID	18	292	79	288	173	3	49
YP/CELE3/BASA1	17	279	75	228	165	3	48
YP/CELE3/AGSP	23	97	26	260	62	4	16
YP/ARTRV-PUTR	18	229	62	202	139	3	50
YP-PSME/PUTR/WYMO	18	231	63	208	145	3	48
YP/PUTR/SEINM//GRANITE	20	232	63	325	145	3	39
YP-QUKE/PUTR/POA//GRANITE	15	178	48	280	104	4	36
YP-ABCO/STOC1//ASH	33	241	65	288	176	2	100
YP-ABCO/QUWI	26	196	53	422	134	4	37
YP-ABCO/AMPA2-BERE	19	247	67	418	146	3	52
YP-ABCO/SYAC/WYMO	17	257	69	294	165	4	44
YP-ABCO/QUVA/WYMO	18	233	63	268	151	4	40
YP-QUKE/AMPA2	17	260	70	255	159	3	53

QMD = Average quadratic mean diameter, inches
SDI = Reineke's (1933) Stand Density Index, as modified by McClean and Bolsinger (1973)
%SDI NORMAL = Percent of SDI value of 370 (Knapp 1981)
PROD INDEX = Productivity index in ft^3/acre

APPENDIX D

COMPARISON TABLE: CHARACTERISTICS OF PONDEROSA AND JEFFREY PINE

CHARACTERISTICS OF JEFFREY VS. PONDEROSA PINE

ATTRIBUTE	JEFFREY PINE	PONDEROSA PINE
Bark underside color (mature trees)	Reddish-gray	Bright yellow
Current year's stem growth (any age tree)	Glaucous-gray	Smooth, resinous green or brown with age
Bark hardness, e.g., when stabbed with a tape nail	Hard	Soft--easily indented with a fingernail
Cones	Large (>5" long)	Small (<5" long)
Needle color	Gray-green	Bright green
Odor	*****INCONSISTENT*****	
Cone prickles	*****INCONSISTENT*****	

APPENDIX F

EASTSIDE PINE
FIELD FORM

ZONE 2 **EASTSIDE PINE FIELD FORM** DATE_____

T._____R._____SEC._____ OBS._____SOILS/GEOL._____

FOREST_____ DISTRICT_____
POSITION_____ SLOPE CONFIGURATION_____
Scarce/Rare: <1%; 1 or 2 small plants **Common**: 1 - 5%; several plantts **Well Represented**: >5%; readily apparent; Abundant: >25% **Present**: Found in plot. **Poorly Represented**: Absent or scarce to 3%

Scientific name	Code	Common Name	%Cover OS (>1"dbh)	%Cover US (<1"dbh)
TREES				
Abies concolor	ABCO	White fir		
Calocedrus decurrens	CADE3	Incensecedar		
Juniperus occidentalis o.	JUOCO	Western juniper		
Juniperus occidentalis a.	JUOCA	Sierra juniper		
Pinus contorta	PICO1	Lodgepole pine		
Pinus jeffreyi	PIJE	Jeffrey pine		
Pinus lambertiana	PILA	Sugar pine		
Pinus monticola	PIMO3	Western white pine		
Pinus ponderosa	PIPO	Ponderosa pine		
Pinus washoensis	PIWA	Washoe pine		
Pseudotsuga menziesii	PSME	Douglas fir		
Quercus garryana	QUGA	Oregon white oak; Garry oak		
Quercus kelloggii	QUKE	Black oak		
SHRUBS				
Amelanchier palllida	AMPA2	Serviceberry		
Artostaphylos nevadensis	ARNE	Pinemat manzanita		
Arctostaphylos patula	ARPA9	Greenleaf manzanita		
Artemisia tridentata vasey.	ARTRV	Mountain big sagebrush		
Berberis repens	BERE	Dwarf oregongrape		
Cercocarpus betuloides	CEBE2	Birchleaf mtn. mahogany		
Cercocarpus ledifolius	CELE3	Curlleaf mtn. mahogany		
Ceanothus velutinus	CEVE3	Snowbrush		
Chrysolepus sempervirens	CHSE2	Bush chinquapin		
Prunus emarginata	PREM	Bitter cherry		
Prunus subcordata	PRSU2	Modoc plum		
Prunus virginiana	PRVI	Chokecherry		
Purshia tridentata	PUTR	Bitterbrush		
Quercus vaccinifolia	QUVA	Huckleberry oak		
Quercus wislizinii	QUWI	Interior live oak		
Rhamnus rubra modocensis	RHRUM	Modoc coffeeberry		
Rhus triloba quinata	RHTRQ	Skunkbrush		
Ribes cereum	RICE	Wax current		
Ribes viscosissimum	RIVI	Sticky current		
Salix scouleriana	SASC	Scouler willow		
Symphoricarpos acutus	SYAC	Spreading snowberry		
Symphoricarpos vacc.	SYVA	Mountain snowberry		
FORBS				
Arnica cordifolia	ARCO3	Heartleaf arnica		
Balsamorhiza sagittata	BASA1	Arrowleaf balsamroot		
Horkelia fusca	HUFUP	Dusky horkelia		
Monardella odoratissima	MOOD	Monardella		
Penstemon gracilentus	PEGR3	Slender penstemon		
Penstemon cinereus	PECI1	Ashy penstemon		
Penstemon deustus	PEDEH	Hot rock penstemon		
Senecio intergerrimus maj.	SEINM	Butterweed		
Stellaria jamesiana	STJA	Starwort		
Wyethia mollis	WYMO	Mulears		
GRAMINOIDS				
Agropyron spicatum	AGSP	Bluebunch wheatgrass		
Bromus orcuttianus	BROR1	Orcutt Brome		
Carex brainerdii	CABR5	Brainerd's sedge		
Carex inops	CAIN2	Long-stoloned sedge		
Carex multicaulis	CAMU1	Multi-stemmed sedge		
Elymus glaucus	ELGL	Blue wildrye		
Festuca idahoensis	FEID	Idaho fescue		
Festuca occidentalis	FEOC	Western fescue		
Poa canbyi	POCA3	Canby bluegrass		
Poa nervosa	PONE1	Wheeler bluegrass		
Poa sandbergii	POSA3	Sandberg bluegrass		
Stipa occidentalis	STOC1	Western needlegrass		

APPENDIX G

ETHNOBOTANICAL NOTES: NATIVE AMERICAN USES OF EASTSIDE PINE PLANTS

ETHNOBOTANICAL NOTES: NATIVE AMERICAN USES OF EASTSIDE PINE PLANTS

Many of the plants listed in this Guide have been used for cultural and medicinal purposes by the Native American residents of northeastern California and Northwestern Nevada. Please note that the uses listed here are for reference only. The citations for this section are Anderson (1990), Train (1941) and Murphey (1959).

A partial listing of medicinal and other uses follows:

Abies concolor
Soft resin used as a tuberculosis cure. Warmed pitch used as a poultice for sores and boils. Tea from the needles used for pulmonary troubles.

Achillea millefolium
A tea from the inflorescence was used for indigestion, or for a liniment for muscular pains. A poultice of mashed leaves used for swellings or sores, also for collar sores on work horses. Roots used for toothache.

Amelanchier alnifolia
Decoction of inner bark used for snow blindness. Fruit used for a violet dye.

Arenaria aculeata
Solution of boiled roots used for an eyewash.

Artemisia tridentata
Boiled leaves used for colds, and for a cough remedy. Preparation from leaves makes a soft green dye. The bark was used for cordage and woven into clothing.

Astragalus spp.
Decoction of boiled roots used for toothache.

Balsamorhiza sagittata
Mashed root was used for insect bites. The ripe seeds were made into a ground meal; stirred with boiling water to make a mush.

Berberis repens
Tea from leaves used for general aches and pains.

Calocedrus decurrens
A tea used for protection from contagious disease. Wood used for bows.

Cercocarpus ledifolius
Used for pulmonary disorders, especially tuberculosis. Bark used for sores, cuts and wounds. This wood is very hard and dense, and the fire-hardened wood was used for arrow tips. Inner bark used as component of a purple dye.

Chamaebatiaria millefolium
Tea from the leaves used for stomach problems.

Chrysothamnus nauseosus
Boiled stems and leaves used for a cough remedy. Flowers used to make a yellow dye.

Chrysothamnus viscidiflorus
Cough remedy; rheumatism remedy.

Eriogonum umbellatum
A tea made from the roots was used for colds.

Frasera speciosa
Root decoction was used as a tonic for general weakness.

Leptodactylon pungens
Employed as a wash for soreness in the eyes.

Juniperus occidentalis
Plant parts used as a basis for cold and cough remedies, and as a general tonic. Juniper berries were pierced and used for beads in some locales.

Linum lewisii
Remedy for sore eyes; a poultice used to reduce swellings.

Lithospermum ruderale
Contraceptive/sterilant. Also used for making a red dye.

Monardella odoratissima
Tea was used for a cold remedy.

Montia perfoliata
Eaten for greens by Native Americans and early-day settlers and miners.

Osmorhiza spp.
Used mostly for a cold remedy, and to reduce fevers.

Paeonia brownii
Decoction was used for tuberculosis, and the roots for a poultice.

Penstemon deustus
Poultice made from the leaves used for swellings.

Penstemon spp.
Used to deaden the pain of toothache.

Pinus jeffreyi
See Pinus ponderosa.

Pinus ponderosa
Roots were harvested with a small axe or by slowly burning through the green root with a small fire. These were then used for the structural and design elements in baskets.

Prunus virginiana
A tea used as a tuberculosis treatment, and for coughs and colds. Fruits of all the Prunus species were used for food. Fruit made into a red dye.

Purshia tridentata
Used for contagious diseases. Cooked ripe seed coats make a violet dye.

Quercus kelloggii
Acorns from this tree were favored for food. Bitterness was leached out by repeated water rinses.

Rhus trilobata quinata

The coppiced (pruned) shoots were used for basketry material. The berries were made into a drink. Used as a component in a black dye.

Rosa woodsii

A tea used as a cold remedy. The coppiced wood was used for arrows and other kinds of projectiles.

Smilacina stellata

The dried root was pounded into powder and used for clotting blood from wounds.

Symphoricarpos spp.

Coppiced wood was used for lightweight arrows.

Wyethia mollis **(Poisonous)**

Parts used as a physic or emetic.

Zigadenus paniculatus **(Poisonous)**

Bulb was used externally for swellings and bruises.

APPENDIX H

FIRE AND SERAL PATHWAYS

FIRE AND SERAL PATHWAYS

Moir and Dieterich (1988) described a general successional model for Pine-Bunchgrass forests in Arizona and New Mexico. This model, with modifications, is applicable to most of the plant associations described in this guide.

Twelve major successional stages are recognized in the fire succession of these forests, as described below. Refer to the Successional Stage Diagram, page 167, following the descriptions:

1. Shrub/Herbaceous Opening ("Full Meadow" in Moir)

These are openings in the forest that can vary in size from less than 1 acre to more than 5 acres, capable of growing trees. A meadow can be a dry opening as well as a wet opening. Vegetation is characterized in the study area by a mixed stand of herbaceous vegetation and shrubs.

2. Shrub/Herbaceous Opening-Seedling ("Meadow-Seedling")

Tree invasion into an opening or meadow in the absence of fire or other tree limiting processes. Requirements for establishment of a pine seedling stand are dispersal of an abundant and viable seed crop into the meadow or opening, a favorable seed bed, successful penetration of pine primordial roots into mineral soil, adequate soil moisture, opportunity for mycorrhizal formation, absence of fire, and high light intensity.

3. Pole-Sapling

Without a fire every decade or so, seedlings of Stage 2 grow unthinned to sapling or pole sizes. New trees continue to become established in openings. Herbaceous and shrub species gradually decline as growing clusters of trees begin to exert shade and physiological dominance over the site.

A low intensity fire or fires early in the Pole-Sapling stage leads to the following stage:

4. Thinned Pole-Herbaceous (Shrub)

Low intensity fires result in partial pine mortality; smaller diameter trees are killed more readily than larger trees. In Arizona, a ponderosa pine of 6 to 8 inches dbh is relatively resistant to understory burns, and larger pole-sized trees (8 to 11 inches dbh) are more resistant yet. White fir trees of similar or smaller diameters are killed by fire at this stage. Canopy cover of herbaceous and shrub species varies with spacing and basal area of the trees in the stand.

4a. Closed Pole

This stage develops from stages 3 or 4 if low intensity fires are absent, infrequent, or ineffective in thinning small trees to very low densities. This is close to the "doghair thicket" stage. The site is overstocked and canopy cover is high. As a result, herbaceous and shrub canopy cover are very low. Moir states that this stage is commonly open enough for fire to be an effective tree-thinning factor without extensive site preparation.

5. Closed Blackjack ("Bull Pine"; "Blackbark Pine")

This stage develops from unthinned stands that have survived 100 years or more without fire or from Stage 4a closed pole stands where fires have been excluded for thirty or more years. The fuel accumulation, and fire hazard in these stands is very high. Fuel ladders are present, and hot fires will crown.

6. Open Blackjack-Herbaceous-Shrub

Recurrent understory fires in stages 4 or 4a result in an open blackjack-blackbark pine stand. Patch size varies. Herbaceous and shrub vegetation cover is moderate. Stands have an open parklike appearance but lack older yellowbark trees. Stands of varying tree density occur in a mosaic pattern, fuels are discontinuous, and there is limited opportunity for high intensity crowning fire except under extreme circumstances.

6a. Closed Blackjack (Blackbark)

This stage is structurally similar to Stage 5 (Closed Blackjack), but has a different origin. Stage 6a stands develop from cessation of low intensity fires in the Stage 6 Open Blackjack-Herbaceous-Shrub stands. This stage has high fuel loading and can go one of two ways: Low intensity fires with short duration will thin the stand and development towards a Stage 8 (Open Yellowbark) condition will progress. However, the opportunity for high intensity fires and stand replacement exists because of the high fuel loading.

7. Closed Yellowbark

In Moir's paper, this stage is conjectural because a 200 year or longer history without wildfire is unknown in the Southwest (and in northeastern California). This would be a continuous closed pine stand of trees greater than 12" dbh and less than 150 years old. Understory vegetation would be very sparse, and fire hazard would either be very high (high fuel loading) or very low, except under catastrophic conditions. Susceptibility to mortality from insect attack would be very high in these overstocked and suppressed stands. Stage 7 is predicted from continuous fire suppression or fire absence throughout the life of the stand.

8. Open Yellowbark

Stands are open and parklike, dominated by stands of ponderosa or Jeffrey pine, or mixtures of both. Additional size classes can occur as small groups of even-aged seedling, saplings, poles and younger yellowpine. Shrub and herbaceous communities are well developed because of the open nature of the stands. This stage defines the beginning of old-growth forest. The attributes of stand structure and young yellowpine in savannalike stands favor continued development into old growth.

9. Closed Yellowpine-Snag

This stage develops from open yellowpine (stage 8) stands as dense understory thickets develop in the absence of fire. Understory thickets are often composed of white fir or suppressed pine in the Eastside Pine study area. Considerable forest fuels have accumulated in the forms of fine and coarse woody debris and green understory pines or white fir. Tree crowns create a patchy but continuous fuel ladder from sapling and pole thickets into the overstory trees. The herbaceous and shrub cover have been shaded out by the dense tree cover. This stage is "degenerate Old Growth".
This stage is often well expressed in undisturbed settings such as parks, RNAs (e.g., Black's Mountain), wildernesses, and similar areas. Pine-white fir communities have a strong component of white fir at this stage. Susceptibility to crown fire and stress-induced mortality is very high, and the largest trees are affected as well as smaller trees.

White Fir

This stage is a probability with successful fire exclusion in White fir-Pine series stands. It's unknown at this point if all White fir-Pine stands will become self-sustaining white fir communities in the continued absence of fire: this situation apparently was rare in presettlement conditions. White fir mortality and/or wildfire may prevent true white fir stands from developing in these drier sites.

10. Open Yellowpine-Snag

This stage develops from the open yellowpine stage (stage 8), and is the classic " Old Growth Eastside Pine Forest". Snags accrue as the older ponderosa and Jeffrey pine die. Recurrent fires prevent heavy fuel accumulation, and help maintain a herbaceous-dominated understory, with some shrubs. This stage has a relatively clean understory aspect. This stage is regarded as "preferred old-growth".

11. Snags

This stage results from destructive high intensity fires, especially in stage 9 stands. Crown scorch or consumption kills most mature and old trees in the stand.

12. Closed Fire Shrub

This stage follows high intensity fires in stages 5, 6a, 7, and 9. Shrubs such as greenleaf manzanita, snowbrush, mahala mat, and, possibly scouler willow, rabbitbrush, or bloomer goldenweed germinate from dormant seed in the soil or offsite seed sources and dominate the site. Greenleaf manzanita and snowbrush are shade intolerant and will eventually die out when shaded by a developing tree canopy. These shrubs enrich the soil (e.g., snowbrush and mahala mat fix atmospheric nitrogen; mahala mat can be a good mulch), and eventually site modification will result.
Shrubfields have high fuel loading from fallen snags, fine fuels, and the shrubs themselves. Continuing high intensity fires maintain the shrub stands. Fire exclusion will eventually permit tree establishment, depending on seed sources and other factors.

MAJOR PATHWAYS

Succession with Fire protection

The main sequence from meadow, or opening to closed forest is given by stages 1,2,3,5, and 7. Stage 7 is hypothetical at present. Moir's theory is that stage 7 will not develop into stage 9 because stage 7 stands are almost certain to experience a high intensity fire over an additional 100 year period. The most probable outcome of succession in Eastside Pine stands without fire is stage 11, the snag forest, leading to Stage 12, the Shrubfield.
Herbaceous and shrub understory in this scenario is very sparse because of competition for light, moisture, and nutrients from trees.

Succession with Recurrent Low Intensity Fires

The sequence under condition of recurring low intensity fires is given by stages 1,2,3,4,6,8, and 10. This is the "natural" pathway of succession in these fire-dependent ecosystems. Several researchers have postulated fire intervals of 5 to 20 years in Eastside Pine on the average, although not every acre was necessarily burned this often.
According to Moir, there are two stable stages in this sequence: The meadows or openings can burn often enough to preclude tree establishment. The second "fire climax" is stage 10, representing open old-growth stands. These stands have been subjected to low intensity fires throughout their development, and crown fires were probably absent from these forests. The recurrence of low intensity fires keeps both green and nongreen fuels at low levels and precludes high intensity fires.

Succession with Intervals of Fire Suppression

This sequence is the prevailing pattern in northeastern California today. Stands have established under conditions of recurrent low intensity fires, and have developed into further stages as the result of fire prevention and suppression. The pathway is given by stages 4a, 6a, and 9.

The following is quoted directly from Moir:

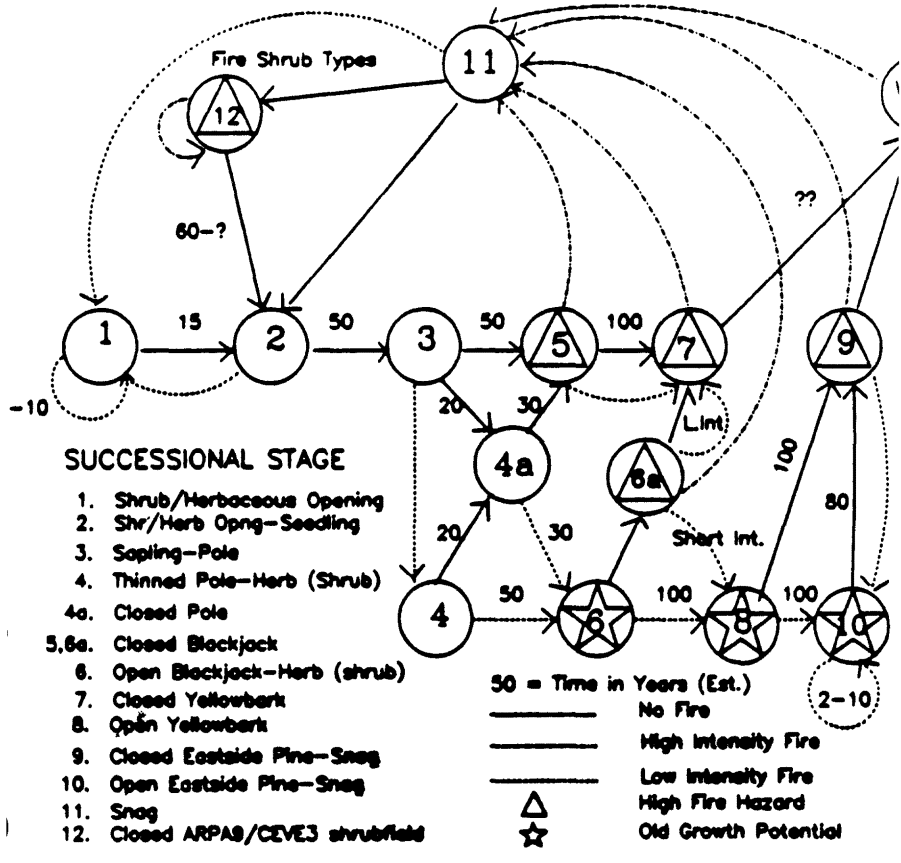
"Stages 3, 4a, and 6a are critical switching points in multipath succession. Managers should be aware that a decision to exclude or permit low intensity fires at these stages determines whether pine forest will close up or remain open, will maintain low or moderate herbage, or will develop a high or low fire hazard. In these relatively young stages the resumption of low intensity fires by means of prescription burning can return succession to a more natural sequence. Thickets of young regeneration are readily thinned by understory burning, yet fuel loads are low and nonhazardous." Moir further notes that if stages 7 or 9 are reached through a long period of fire suppression, then low intensity fires are less effective for thinning since many pines have reached fire resistant stem sizes.

Most of the stands sampled for the Eastside Pine classification had not burned in 60 or 70 years.

Succession with High Intensity Fires

This sequence is represented by stages 5, 6a, 7 and 9, leading ultimately to Stages 11 and 12 by means of high intensity fire. Moir states that much of the present-day "old growth" pine stands in the Southwest are at risk from this pathway. This can also be said of many of the older stands in the Eastside Pine study area.

SUCCESSIONAL STAGE DIAGRAM



APPENDIX I

SOIL TAXONOMY TABLE

SOIL TAXONOMY TABLE

PIJE-QUKE/RHRTQ

Lawyer	loamy-skeletal,mixed,mesic,Pachic,Ultic Argixerolls

PIJE/ARTRV/FEID

Demasters	fine-loamy,mixed,frigid,Pachic Ultic Argixerolls
Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Winton	fine-loamy,mixed,frigid,Ultic Haploxerolls

PIJE/PUTR/WYMO

Fopiano	loamy-skeletal,mixed,frigid,Lithic Ultic Haploxeralfs
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Kyburz	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls

PIJE/PUTR-SYVA/POA

Etchen	loamy-skeletal,mixed,frigid,Mollic Haploxeralfs
Haypress	sandy,mixed,frigid,Entic Haploxerolls
Kilmer	coarse-loamy,mixed,frigid,Ultic Haploxerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Kyburz	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Patio	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Sattley	loamy-skeletal,mixed,frigid,Ultic Argixerolls
Smarts	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls
Trojan	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Umpa	loamy-skeletal,mixed,frigid Dystric Xerochrepts
Wapi	sandy-skeletal,mixed,frigid,Lithic Xerorthents

PIJE/PUTR-CELE3/STOC1

Franktown	coarse-loamy,mixed,frigid,Typic Xerumbrepts
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls

PIJE/CELE3

Hiibner	clayey-skeletal,monmorillonitic,mesic,Ultic Argixerolls
Jorge Variant	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Shaver	coarse-loamy,mixed,mesic,Pachic Ultic Haploxerolls

PIJE-ABCO/SYVA/PONE1

Bucking	loamy,mixed,frigid,Entic Xerumbrepts
Franktown	coarse-loamy,mixed,frigid,Typic Xerumbrepts
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Ledmount	loamy-skeletal,mixed,frigid,Lithic Pachic Xerumbrepts
Sattley	loamy-skeletal,mixed,frigid,Ultic Argixerolls
Smarts	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Umpa	loamy-skeletal,mixed,frigid Dystric Xerochrepts

PIJE-ABCO/PONE1//GRANITE

Bucking	loamy,mixed,frigid,Entic Xerumbrepts
Haypress	sandy,mixed,frigid,Entic Haploxerolls
Toiyabe	mixed,frigid,Shallow Typic Xerpsamments

PIPO/CELE3-PUTR/FEID

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Fordice	loamy-skeletal,mixed,mesic Ultic Argixerolls
Hiibner	clayey-skeletal,monmorillonitic,mesic,Ultic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic,Ultic Argixerolls
Nonest	cindery over loamy, mixed, mesic,Thapto-xeralfic Typic Xerorthents
Rockford	loamy-skeletal,mixed,mesic, Ultic Haploxerolls
Wrentham	loamy-skeletal,mixed,mesic,Pachic Haploxerolls

PIPO/PUTR/STOC1//PUMICE

Holland	fine-loamy,mixed,mesic,Ultic Haploxeralfs
Neer	medial-skeletal,mesic,Andic Xerochrepts
Nonest	cindery over loamy, mixed, mesic,Thapto-xeralfic Typic Xerorthents
Skalan	loamy-skeletal,mixed,mesic,Ultic Haploxeralfs
Yallani	medial-skeletal,frigid,Dystric Xerochrepts

PIPO/PUTR/FEID

Alcot	cindery,mesic,Typic Xerorthents
Bearskin	loamy,mixed,frigid,Lithic Argixerolls
Brownlee	fine-loamy,mixed,mesic,Ultic Argixerolls
Demasters	fine-loamy,mixed,frigid,Pachic Ultic Argixerolls
Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Hiibner	clayey-skeletal,monmorillonitic,mesic,Ultic Argixerolls
Holland	fine-loamy,mixed,mesic,Ultic Haploxeralfs
Kilmer	coarse-loamy,mixed,frigid,Ultic Haploxerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Konocti	loamy-skeletal,mixed,mesic,Typic Haploxerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic,Ultic Argixerolls
Olete	loamy-skeletal,mixed,mesic,Typic Xerochrepts
Sadie	medial,skeletal,Andic Xerochrepts
Shaver	coarse-loamy,mixed,mesic,Pachic Ultic Haploxerolls
Sheld	medial-skeletal,frigid,Andic Xerumbrepts
Skalan	loamy-skeletal,mixed,mesic,Ultic Haploxeralfs
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls

PIPO/PUTR/BASA1

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic,Ultic Argixerolls

PIPO/PUTR-RICE/BROR1

Germany	medial,mesic,Andic Xerumbrepts
Washougal	medial-skeletal,mesic,Andic Xerumbrepts

PIPO/PUTR-PRUNUS/BROR1

Fordice	loamy-skeletal,mixed,mesic,Ultic Argixerolls
Germany	medial,mesic,Andic Xerumbrepts
Washougal	medial-skeletal,mesic,Andic Xerumbrepts
Xerumbrepts	medial-skeletal,mesic,Lithic Xerumbrepts

PIPO/PUTR-PRUNUS/AGSP

Germany	medial,mesic,Andic Xerumbrepts
Washougal	medial-skeletal,mesic,Andic Xerumbrepts
Xerumbrepts	medial-skeletal,mesic,Lithic Xerumbrepts

PIPO/PUTR-CEVE3-ARPA9/BROR1

Germany	medial,mesic,Andic Xerumbrepts
Ledmount	loamy-skeletal,mixed,frigid,Lithic Pachic Xerumbrepts
Washougal	medial-skeletal,mesic,Andic Xerumbrepts

PIPO/ARTRV/FEID

Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Patio	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls
Winton	fine-loamy,mixed,frigid,Ultic Haploxeralfs

PIPO/AMPA2-PRUNUS

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Hiibner	clayey-skeletal,montmorillonitic,mesic,Ultic Argixerolls
Holland	fine-loamy,mixed,mesic,Ultic Haploxeralfs
Jacket	fine,montmorillonitic,mesic,Pachic Ultic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Marcola	clayey-skeletal,mixed,mesic,Pachic Ultic Argixerolls

PIPO/AMPA2-BERE/ARCO3

Brownlee	fine-loamy,mixed,mesic,Ultic Argixerolls
Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Hiibner	clayey-skeletal,montmorillonitic,mesic,Ultic Argixerolls
Inville	loamy-skeletal,mixed,frigid,Ultic Haploxeralfs
Jacket	fine,montmorillonitic,mesic,Pachic Ultic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Marcola	clayey-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Puls	clayey,montmorillonitic,mesic,shallow,Abruptic Xerollic Durargids

PIPO-QUKE/PUTR/STOC1

Neer	medial-skeletal,mesic,Andic Xerochrepts
Washougal	medial-skeletal,mesic,Andic Xerumbrepts

PIPO-CADE3/PUTR/BASA1

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Jacket	fine,montmorillonitic,mesic,Pachic Ultic Argixerolls
Keating	fine,montmorillonitic,mesic,Typic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls

PIPO-ABCO-PICO1/AMPA2

Brownlee	fine-loamy,mixed,mesic,Ultic Argixerolls

PIPO-ABCO-QUKE/AMPA2

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls

PIPO-ABCO/AMPA2-BERE

Bertag	**fine,montmorillonitic,frigid,Pachic Ultic Argixerolls**
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Patio	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Smarts	loamy-skeletal,mixed,frigid,Pachic Ultic Argixerolls

PIPO-ABCO/AMPA2-CEVE3/BROR1

Germany	medial,mesic,Andic Xerumbrepts
Holland	fine-loamy,mixed,mesic,Ultic Haploxeralfs

PIPO-ABCO/CEVE3/STOC1

Germany	medial,mesic,Andic Xerumbrepts
Inville	loamy-skeletal,mixed,frigid,Ultic Haploxeralfs

PIPO-ABCO/PUTR-ARPA9/STOC1

Klicker	loamy-skeletal,mixed,frigid,Ultic Argixerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Patio	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Portola	medial,frigid,Andic Xerochrepts
Sattley	loamy-skeletal,mixed,frigid,Ultic Argixerolls
Tahoma	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Winton	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Yallani	medial-skeletal,frigid,Dystric Xerochrepts

PIPO-ABCO/SYAC

Franktown	loamy-skeletal,mixed,frigid,lithic Ultic Haploxeralfs
Inville	loamy-skeletal,mixed,frigid,Ultic Haploxeralfs
Jorge Variant	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls

PIWA/ARNE2

Supervisor	loamy-skeletal,mixed,Typic Cryoborolls

PIWA-ABCO/SYVA/STJA

Behanin	loamy-skeletal,mixed,Pachic Cryoborolls
Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Gallatin	fine-loamy,mixed,Pachic Cryoborolls
Nathrop	loamy-skeletal,mixed,Argic Cryoborolls
Smarts	loamy-skeletal,mixed,frigid,Pachic Ultic Argixerolls
Tatiyee	clayey-skeletal,montmorillonitic,Argic Cryoborolls

YP/RHRUM/POSA3

Bakeoven	loamy-skeletal,mixed,mesic,Lithic Haploxerolls
Fordice	loamy-skeletal,mixed,mesic Ultic Argixerolls
Hohmann	fine-loamy,mixed,mesic,Typic Xerochrepts
Rockford	loamy-skeletal,mixed,mesic,Ultic Haploxerolls

YP/PUTR/FEID//GRANITE

Bonta	coarse-loamy,mixed,frigid,Typic Haploxeralfs
Bucking	loamy,mixed,frigid,Entic Xerumbrepts
Haypress	sandy,mixed,frigid,Entic Haploxerolls
Toiyabe	mixed,frigid,Shallow Typic Xerpsamments
Wapi	sandy,mixed,frigid,Dystric Xerpsamments

YP/PUTR/FEID

Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls
Witzel	loamy-skeletal,mixed,mesic,Lithic Ultic Haploxerolls

YP/CELE3/BASA1

Demasters	fine-loamy,mixed,frigid,Pachic Ultic Argixerolls
Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Fordice	loamy-skeletal,mixed,mesic Ultic Argixerolls
Hiibner	clayey-skeletal,montmorillonitic,mesic,Ultic Argixerolls
Jacket	fine,montmorillonitic,mesic,Pachic Ultic Argixerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Lamondi	loamy-skeletal,mixed,frigid,Pachic Ultic Haploxerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls
Rockford	loamy-skeletal,mixed,mesic,Ultic Haploxerolls
Smarts	loamy-skeletal,mixed,frigid,Pachic Ultic Argixerolls

YP/CELE3/AGSP

Anatone	loamy-skeletal,mixed,frigid,Lithic Haploxerolls
Duckhill	loamy-skeletal,mixed,frigid,Lithic Haploxeralfs
Gaib	loamy-skeletal,mixed,frigid,Lithic Ultic Argixerolls

YP/ARTRV-PUTR

Jorge Variant	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Kyburz	fine-loamy,mixed,frigid,Lithic Ultic Haploxeralfs
Kyburz	coarse-loamy,mixed,frigid,Ultic Haploxeralfs
Sattley	loamy-skeletal,mixed,frigid,Ultic Argixerolls
Sierraville	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Tahoma	coarse-loamy,mixed,frigid,Ultic Haploxeralfs
Tahoma	loamy,mixed,frigid,Ultic Haploxeralfs
Tahoma	loamy-skeletal,mixed,frigid,Ultic Haploxeralfs

YP-PSME/PUTR/WYMO

Delleker	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Fugawee	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Trojan	fine-loamy,mixed,frigid,Ultic Argixerolls

YP/PUTR/SEINM//GRANITE

Bucking	loamy,mixed,frigid,Entic Xerumbrepts
Toiyabe	mixed,frigid,Shallow Typic Xerpsamments

YP-QUKE/PUTR/POA//GRANITE

Haypress	sandy,mixed,frigid,Entic Haploxerolls
Toiyabe	mixed,frigid,Shallow Typic Xerpsamments

YP-ABCO/STOC1//ASH

Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Zynbar	medial,frigid,Entic Dystandepts

YP-ABCO/QUWI

Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls

YP-ABCO/AMPA2-BERE

Haploxerolls	loamy-skeletal,mixed,frigid,Cumolic Ultic Haploxerolls

YP-ABCO/SYAC/WYMO

Euer Variant	loamy-skeletal,mixed,frigid, Ultic Haploxeralfs
Franktown	loamy-skeletal,mixed,frigid,lithic Ultic Haploxeralfs
Jorge Variant	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Klicker	loamy-skeletal,mixed,frigid,Ultic Haploxerolls
Sattley	loamy-skeletal,mixed,frigid,Ultic Argixerolls

YP-ABCO/QUVA/WYMO

Franktown	loamy-skeletal,mixed,frigid,lithic Ultic Haploxeralfs
Kyburz	fine-loamy,mixed,frigid,Ultic Haploxeralfs
Kyburz	loamy-skeletal,mixed,frigid,Ultic Haploxeralfs

YP-QUKE/AMPA2

Elmore	fine-loamy,mixed,mesic,Pachic Ultic Argixerolls
Lawyer	loamy-skeletal,mixed,mesic,Pachic Ultic Argixerolls